

PC

Independent Guide to
IBM Personal Computers

Volume 1 Number 1 \$3.00

What to Tell the Taxman
The Federal Reserve
Discovers the PC
PC on Campus: A
Lab For All Seasons
How to Write (and Sell)
a Computer Game

Blackjack Software Goes to Market



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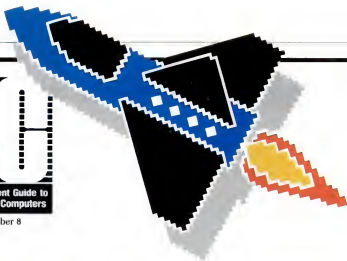
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The Independent Guide to
IBM Personal Computers

Volume 1, Number 8
December, 1982



In This Issue

MARKETPLACE

Hot Deal: Blackjack 52 Software Goes to Market/David Searls

A gameware company, an advertising agency, and a gambler combine their expertise to market a professional product.

How to Shop for Educational Software/ Douglas Q. Cobb 45

Doing your homework can prevent frustration at the terminal.

GAMES

Adventure Is the Game/Greg Estes 82

Fantasies that take you from Darwin to Captain Kirk.

Games People Play/ Martin Oakes 89

Crosswords and puzzles for the stress-weary exec.

From Fantasy to Video Reality/Richard Cook 99

Indulge your imagination with a trip to the unknown.

A Sideshow of Horrors 111 and Delights/Les Cowan

The thrill of discovery and a chance encounter with the cosmos.



Super Players Run the Gauntlet/Lindsay Van Gelder 131

When being human just isn't enough.

Running, Reptiles and 'Rithmetic/Douglas Q. Cobb 139

Games for the agile adult.

From Stock Portfolios 150 to Art Portfolios/Davis Foulger

Sophisticated fun for the millionaire, the treasure seeker, or the artist.

Space Wars and Earth 165 Games/Steve Liebson

Take a ride on a starship or stay home and revel in a hand of blackjack.

Fear and Learning/ Corey Sandler 174

Video with a flair for knowledge.

EDUCATION

A Lab for All Seasons/ Stan Franklin 184

At Memphis State University the PC is the big machine on campus.

Computer Camps/ Barbara Harvie 195

From reluctant adult to eager teen, computer camps offer literacy to all ages.

The PC Goes to School/Gary Young 208

The rise and fall of computer-assisted instruction in the classroom.

LOGO: A Language 216 for Children of All Ages/Danny Goodman

Seymour Papert's delightfully simple language, customized for the PC.

Educational Software 226 for the PC/Ronald H. Axtell & Richard A. Walker

PC reviews educational games, systems and training software, drills, and tutorials.

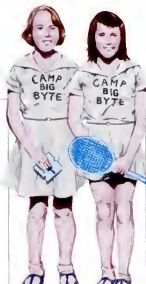
Recess Is Over/Linda 252 V. Williams

An allocated \$27.5 million adds computer literacy to the traditional curriculum.

SECT Demystifies 259 the Microcomputer/Lindsay Van Gelder

Gotham crams the high tech revolution into a 90-minute crash course on computer training.





SOFTWARE

- The Best Little Programs in Texas/** **241**
Arlene J. Berlin
 How ya gonna keep 'em down on the farm after they've seen Friendlyware?
- A Graphic Rendition/Corey Sandler** **304**
Graphmagic generates pie charts, bar charts, and line graphs on your screen with the ease and eloquence of an artist.

BUSINESS

- FedLine: The Bankers' 246**
Bank Installs the PC/Jeremy Joan Hewes
 Keeping bankers hours with a PC.

PRODUCT REPORT

- Speak to Me, PC!/** **271**
Frank J. Derfler
 The Echo GP Speech Synthesizer.

LEGAL

- How to Copyright Your Software/Daniel Remer** **277**
 Part Three: The legal penalties that help stop software pirates.

PROGRAMMING

- Modus Operandi: 285**
How to Write a Computer Game/Alan E. Heimlich
 A game designer reveals his hook, line, and sinker strategy for producing successful computer games.
- Baking Pi in Your PC/Marshall Fraser** **291**
 How to compute pi on your PC.
- The Next Step: 296**
Introducing the Participant Novel/Scott Prussing
 An aspiring novelist uses the PC to create a new literary genre.

PC PROFILES

- Computers on Campus/Jeremy Joan Hewes** **315**
 Micros proliferate among the halls of ivy.

COLUMNS

- Zero Base Thinking/Jim Edlin** **25**

DEPARTMENTS

- Letters to PC** **15**
P-Communiques **29**
PC Tutor/Mark Zachmann **37**
PC Cartoon **309**



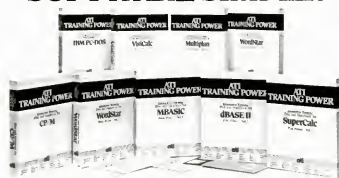
COVER

Illustration: Harold Ikuwsky



- User-to-User/Andrew Fluegelman** **320**
Club News/Susan Hurley **347**
Communications Briefs/Frank J. Derfler **348**
PC Book Review **352**
PC: BlueBook **355**
PC Annual Index **370**
New on the Market **382**
Index to Advertisers **396**
Coming Up **399**
Wish List **400**

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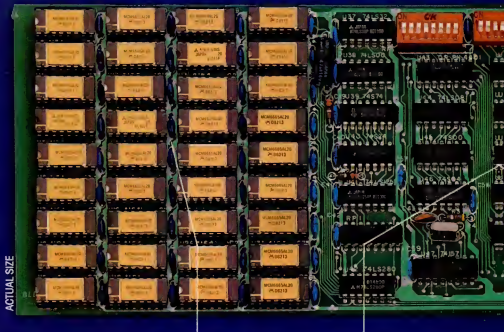
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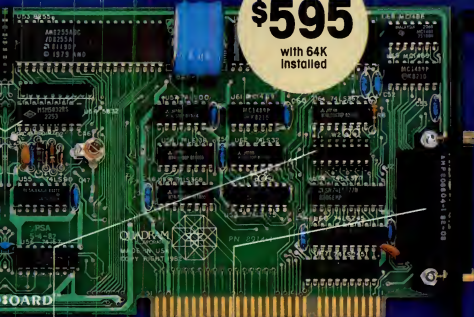
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Letters To PC

Say The Word

I have just come in contact with your magazine and wonder if in past issues you have done a comparative analysis of word processing software available for the IBM PC (including spelling checkers and mail mergers)? I would appreciate any direction you could give me concerning the location of such an analysis, as I would like to make an educated choice and not a decision based on cost alone.

Steven Hite
Somerville, Massachusetts

We are a step ahead of you. See PC, November 1982—Ed.

Positive Improvement

The new EasyWriter offered by IBM (version 1.1) is a great improvement over the original, version 1.0. The no-cost update appears to be easier to use, has fewer bugs, operates faster, and comes with an instruction book that is clearer and more detailed.

There is still at least one error in the new instructions. Underlining, which was nearly impossible with version 1.0 is now feasible with version 1.1, but not if the instructions given on page 13-11 are followed. Instruction 5 states, "Type .SPACE1." The last dot is ambiguous and denotes the end of the sentence. It should not be programmed by the user. Moreover, the important instruction, "Press the Enter key," has been omitted after the "Type .SPACE1" instruction. Finally, the existing Step 6 ("Insert a blank line[F3] under the .SPACE1 command.") is not needed.

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Bytes and Bites

PC is the greatest. I picked up my first copy at COMDEX in June at Atlantic City. To me it is a godsend. I've had my PC since

March 19, and am quite displeased with it, probably because I'm spoiled by the mini-computer that I use at my office. My two major complaints are that it lacks a true ISAM "keyed" file access method and lacks a PC-DOS sort.



I am a proficient programmer/analyst, but I'm not into bits, bytes, and memory allocation and manipulation.

John F. Calichio
Old Bridge, New Jersey

Multiusers

If the IBM PC is to penetrate the small-business market, multiuser capability (up to 5 or 8 users) is a must. Theories and rumors about how to achieve this are abundant: MPM-86, QUNIX, Xenix, Network, etc. Please do an article sorting this out.

Your magazine is very good. I'd like to see more software reviews and a poll of business users to find out what they want from hardware and software. The technicians who build the software don't seem to bother asking, so the resulting software is often of limited use and salability.

David Putnam
Stowe, Vermont

Heart Strings

I would like to point out an error in your article "Beginner's Guide to Strings" (PC, September 1982). Among the examples of "valid" string variable names are STRINGS and NAMES, which are not valid. STRINGS is a reserved function and produces a syntax error when used as a variable name. NAMES is incorrect because it is a command, and it is illegal to add "S" to a command to get a string variable name. Note that the reverse is not true: MID, for example, is a perfectly good variable name even though MIDS is a reserved word.

Engene L. Preece's letter, "Epson Heartache" (PC, September 1982), did not mention the fact that Epson MX-80 printers without Graftrax will print out the calendar program perfectly. IBM did not modify Epson printers; it simply supplies them without Graftrax.

Adam Barr
Montreal, Quebec
Canada

The Groftrax option changes some of the Epson special feature codes—Ed.

Fan Mail

I have been following your magazine with great interest. It contains a wealth of knowledge in both the articles and the advertisements. It is the one magazine that I can turn to for information dealing completely with the IBM PC.

Brian Cameron
Salem, Ontario
Canada

Smith-Corona Pitches In

On the whole, I find PC very interesting, but you have to watch out for your facts. In purchasing a Smith-Corona TP-1, I relied in part on Frank Derfler's review of it, but now I discover that SCM does not offer five fonts for the 12-pitch machine, as Derfler reported. SCM offers only three 12-pitch fonts, all of which have short

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Letters To PC

characters and are, therefore, difficult to read.

For anyone who wants good letter quality output, these fonts are inadequate and a major disappointment. If SCM does not offer a better variety of fonts, I will probably sell my TP-1 and get a printer that has fonts that I like. I wonder if you could help me give SCM the message that they need more and better fonts.

Ernest Lieberman
New York, New York

A spokesperson for Smith-Corona states that the 10-pitch print wheels can be used on the 12-pitch machine. However, the characters will be slightly closer together than normal. Smith-Corona will be re-releasing more print wheels for both the 10- and 12-pitch machines over the next few months. —Ed.

Underlining TP-1

I read with interest your fine review of the Smith-Corona TP-1 printer ("Product Reports," PC, August 1982). I was so impressed that I purchased the printer. In all but one respect I have been delighted with the choice.

I have encountered some difficulty in accessing the underline function from WordStar. You mentioned in the review that the TP-1 performed all these functions flawlessly, but I suspect that you were using it with serial output. I have connected mine to the parallel printer card and find that I can underline only by placing a Ctrl C at the end of the line and then manually reversing the line feed. I am writing to you in the hope that a solution to this problem could be published in PC.

Your review did mention that Volks-writer allows any specific ASCII character to be keyed in through the use of the Alt key and the number pad. If WordStar could do this, it would solve my problem.

In *User-to-User* of the same issue Dr. Ada F. Finifter described a solution for the

same problem with the NEC Spinwriter 3530 printer and EasyWriter. This option [the /USER function] is unfortunately not available through WordStar.

I do hope that a simple answer to my problem is available. In the interim, I am pleased with the printer in all other respects. Thank you for your review and any assistance you might be able to give.

Daniel H. Barco
Durham, North Carolina

The problem you have is that you must select the Backspacing Teletype-like Printer option from the WordStar Install program. Unfortunately, this option is for serial printers only. To change the option so that it will support a parallel printer, load BASIC, load Install, and change the word serial in line 1440 to parallel. Next, change line 2910 to "DATA 0." That's it. SAVE the program, and then run it to reinstall your WordStar program. —Ed.

A Heated Problem

A lot of companies are making combo cards for the PC, and this is supposed to solve the problem of the five-slot (plug-in) limitation. It seems to me that there may be another limitation: the power supply. Do you know of anyone who has developed power (or heat) problems as a result of this?

Larry
San Carlos, California

Our PCs are stuffed full and we have never had any such problems. —Ed.

Sold on the PC

While I was at a computer store several months ago, I picked up a copy of PC. Your magazine has really sold us on the IBM PC since we now need to use more memory than our old micro can support. We now have a subscription to PC to help us prepare for the arrival of our new acquisition

in January.

In reading your article "Calc Wars" (PC, August 1982), I was a bit confused. The article says that VisiCalc does not have a manual recalculation ability. I'm not sure about the PC version, but on the Apple version pressing keys /GRM will put you in the manual recalculation mode. The description you gave of SuperCalc's manual recalculation mode is identical to that of VisiCalc's.

Does the PC version vary from the Apple version or were the names reversed? Please clear up this confusion so I can determine which program to use on my new PC.

K. Margaret Riley
Rochester, New York

Both programs support manual recalculation. The keystrokes you mentioned are also used by the PC version of VisiCalc. —Ed.

Product Guide Update

Thanks for including VersaForm in your PC Product Guide (September 1982). The VersaForm program was listed under the accounting and inventory section. While it is often used for this type of application, it comes closer to being a forms-processing data base program. The current recommended retail price is \$389, which is quite a bit less than the price in the guide (\$495).

Everett R. Kohberger
Vice President, Marketing
Applied Software Technology
Los Gatos, California

A Colossal Achievement

I found the September issue of PC informative and well organized—a colossal achievement. I've put tabs between the sections for easy thumbing.

As a new IBM PC owner, I would like to comment on Lawrence J. Magid's article, "PC on a Budget," from that issue. The author refers to 320K floppy disk drives (\$8,100). At first I thought this was a simple

Letters To PC

typing transposition since the price is correctly stated twice later in the article (\$1,300 for two, \$650 for one); however, it appears that he incorporated the mistake into the total—\$3,100 for two disk drives, \$900 for additional memory, \$150 for serial port, \$300 for connect modem, \$5,000 for printer = \$9,450, supposedly the \$10,000 amount referred to before software.

In addition, I question his component buying method, particularly for the first-time user who will have a difficult enough task getting familiar with the unit without the added burden of trying to install chips and boards correctly and trying to diagnose equipment in the case of an installation error. Undoubtedly, one can save on some of the costs by mail-order purchases, but at what price?

The 16K system unit referenced here was not available at the Sears store where I purchased my configured PC. Indeed, if it had been, I would not have been interested. The author doesn't state it, but in purchasing the IBM equipment unconfigured, there is a hidden \$335 cost over the price of buying a configured package from Sears or ComputerLand. My package price was \$2,405; this included one double-sided disk drive; the additional drive would have cost \$650. That is, \$3,055 for the same configured IBM equipment that is listed separately under "Comparative Costs." Add the other components at the prices listed (monochrome display monitor, 80 cps dot matrix printer, printer cable), and the author's total package price for IBM equipment is \$4,345 against ComputerLand's or Sears' total package price of \$4,010 for the combined, configured package. I'd say that the author needs to go back and check the marketplace.

Chris Rockwell
San Mateo, California

I said that \$3,100 is the price of a "64K system with monochrome display and two 320K floppy disk drives." That is the price of that entire system, not just the floppy drives. The \$1,300 figure you refer to is the

price of the disk drives alone. I can see how you may have misread that sentence, but the information is correct.

The figures do add up to a little under \$10,000. I said that the buyer "can spend \$10,000," and I also indicated that the prices were approximate ("about"). Besides, by the time you add sales tax (in most states) \$9,450 comes very close to \$10,000, plus or minus a few dollars.

You mention that the 16K system was not available at Sears. When the article was written, it was easy to get 16K systems at most IBM Product Centers and ComputerLand stores. IBM has apparently made it more difficult to obtain the bare bones system, though it is still available in some places. If you are disturbed (as I am) about this, I suggest that you write Sears and IBM to complain about the scarcity of the 16K system.

There is no "hidden \$335 dollar cost in purchasing the IBM equipment unconfigured" as you state. The \$2,405 system you speak of does not include a monochrome card or monochrome display. If you add my figures (leaving out the monochrome card and display), you will see that they too add up to \$2,405.

You say that "the author needs to go back and check the marketplace." He did, and he stands by his facts. I do agree, however, that it may not be worth the effort for many users to do their own assembly. Your points on this issue are well taken, but they too are covered in the article.—Lawrence J. Mogid.

Mis-Interpreters

In the beautiful PC Product Guide (September 1982) under Systems Software, you state that compilers such as FORTRAN convert programs (called source code) into machine instructions, which execute faster than programs run by interpreters. You are absolutely correct.

FORTRAN has been the choice language of scientists and engineers since the

early '60s. Unfortunately, and incredibly, IBM FORTRAN executes slower than the BASIC Interpreter, and it requires much more memory. IBM Systems Products Division informs me that it commissioned Microsoft to make IBM FORTRAN as good as or better than Apple FORTRAN. That may be. But the result is still worthless for scientific or engineering use. I am very disappointed in IBM's reaction to complaints about this deficient software.

Frank O. Ellison
Pittsburgh, Pennsylvania

No Back Order

I answered an ad from your magazine by placing an order for four books published by Holt, Rinehart & Winston (p. 193, PC, September 1982). I enclosed a check for \$67.80 to cover the full cost of the books. I soon received one book and a slip indicating that the other books were not available; my order for these books had been cancelled—not back ordered.

I called Holt, Rinehart & Winston and requested that they hold my money and back order the books to save me the inconvenience of reordering. My request was refused. I then asked for an immediate refund of the excess balance of my prepayment.

I have not received a refund. Instead, I received an invoice for \$19.23, which includes the advertised price plus \$2.28 for tax and processing.

David Lund
St. Paul, Minnesota

A spokesperson for Holt, Rinehart & Winston said it is illegal to hold your check for longer than 90 days, so it could not back order your books. A tracer has been put on your missing refund, and some of the books you originally ordered are now in stock.—Ed.

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2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Break-even analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDOB	Double declining balance depreciation
11 TAXDEP	Cash flow vs depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMCH	Computes time needed for money to double, triple, etc
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWTR	Equal withdrawals from investment to leave 0 over
24 SIMPRISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDDVAL	Value of a bond
30 DEPLETE	Depreciation analysis
31 BLACKSCH	Black Scholes options analysis
32 STOCKVAL	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDDVAL2	Value of a bond
35 EPEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARE1	Portfolio selection model: what stocks to hold
38 OPTWRITE	Options writing computations
39 RIVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FGJQJQ	Fixed quantity economic order quantity model
53 ABCOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost benefit waiting line analysis
56 NCFANAL	Net cash flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MORGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMEITR	Time series analysis linear trend
69 TIMECMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSLBD	DOHME business bookkeeping system
77 TIMECLOCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TMUSAN	Time use analysis
83 ASSGN	Use of assignment algorithm for optimal job assign
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRFS	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPROP	Purchase price for rental property
98 SALLEAS	Sale-leaseback analysis
99 RCONVBD	Investor's rate of return on convertible bond
100 PORTVAL	Stock market portfolio storage-valuation program

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Letters To PC

listing of us, number 1104, in your PC Product Guide (September 1982). The "Belling" company you refer to is Bellin Computer Systems, Inc..

I would appreciate your making the readers of PC aware of this error.

D. Bellin, Vice President
Bellin Computer Systems, Inc.
Flushing, New York

The Curse of First

One of the curses of being first is that you get experimented on. I had hardly taken delivery of my IBM PC when the double-sided drive option became available. IBM wants more money to upgrade my single-sided drives than the price of new double-sided drives. As a secondary benefit, I would be left with two expensive boat anchors. Is an upgrade kit available for my single-sided Tandons, and what is involved in a do-it-yourself installation?

Bill Vanderbok
Woodland Hills, California

As a friend once said, "Those who ride the leading edge of technology will be sacrificed upon it." Unfortunately, no upgrade kit is available due to the high precision that would be necessary. Perhaps you should purchase new drives and sell the "bout anchors" through a PC user group. — Ed

UCSD Shortcoming

Regarding "The UCSD p-System" (PC, October 1982), I disagree with the conclusion that the p-System is "a product we recommend to all PC owners." I have owned my PC for 10 months; I've had formal training in BASIC, FORTRAN, and COBOL; and I might add, with some degree of pride, I'm a veteran of EasyWriter version 1.0.

Since I'd like to develop software professionally, I purchased the p-System for its purported portability. Because the only authorized PC dealer in my state is Com-

puterLand [see "P-System," Letters to PC, October 1982] and because I'm tired of dealing with salespersons who don't know what they're selling, I bought mine on the phone from Network Consulting, Inc. (NCI) in Vancouver. SofTech, the licensor, gave them a good rating, and for the price of a long-distance call I can talk with people who are friendly and knowledgeable. NCI has added a number of utilities that some PC users may find helpful.

However, when the four double-sided, double-density disks arrived along with a hefty packet of manuals, I knew I was no longer dealing with my nice IBM BASIC. There is much disk swapping and lots of disk bumble. NCI says that if I had 128K instead of 64K, life would be better, but that's \$500 away. In my opinion, it's the manual support that's the serious shortcoming. No cite little three-ring binders here. Instead, pounds of terse, jargony, Pascal example-oriented prose abound. The editing and filing style of the p-System itself resembles that of DEC's Vax 11/780 minicomputer that I use at the university, which is, to say politely, not as user-friendly as what I have come to appreciate on the PC.

I don't know yet if the p-System, which is expensive, will really do what I want. I do know it will take every bit of knowledge I have now and will acquire in the next few years to master its complexities. Proceed with caution.

A. J. Camp
Hattiesburg, Michigan

IBM Instruments

Many thanks for your comments concerning the IBM Instruments Computer System (PC-Communicues, October 1982). Your article impressed us with its incisiveness, and you were completely accurate in your reporting of the specifications and price. Your observations that the system is definitely designed for laboratory use and is highly modular are right on.

Shipments are just beginning, and volumes are modest as production builds up.

Cecil P. Webb
President, IBM Instruments, Inc.
Danbury, Connecticut

Royalties Revisited

We appreciate the mention of Alpha Software Corp. in "Trading Pens for PCs" (PC-Communicues, October 1982). However, there have been some recent changes in IBM's treatment of programmers that outdate information in the write-up.

As you reported, Alpha Software has published advertisements that offer attractive contracts, including generous advanced royalties, to free-lance programmers who help develop software marketed exclusively to users of the IBM PC. At the time the specific advertisement you mentioned ran in a Boston-area publication, we were indeed paying "up to ten times more than IBM" in advanced royalties.

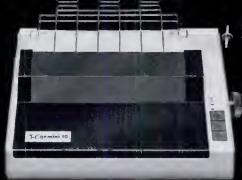
Since that time, IBM has changed its contract terms, and we no longer run that particular advertisement.

Richard Rahins
George Lechter
Alpha Software Corp.
Burlington, Massachusetts

Correction

In Letters to PC (October 1982), we incorrectly listed Intertek as the manufacturer of a special interface for the NEC Spinwriter printer. The product, called The Integrator, is actually manufactured by INTEK Manufacturing Company, 780 Charcot Ave., San Jose, CA 95131.

PC welcomes letter from readers. Write to: Letters, PC, 1528 Irving St., San Francisco, CA 94122. Letters published may be edited.



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feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

Gemini reliability is more than just a promise. It's as concrete as a 180 day warranty (90 days for ribbon and print head), a mean time between failure rate of 5 million lines, a print head life of over 100 million characters, and a 100% duty cycle that allows the Gemini to print continuously. Plus, prompt, nationwide service is readily available.

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You were smart to pick IBM's Personal Computer from all the rest. You have the right hardware.

Now you have the right software too. EasyFamily™ software from IUS is written specifically for the IBM PC. Take EasyFiler™, for example.

EasyFiler is a stand-alone database manager which includes a text editor. Because of the text editor and a built-in report generator, you can custom design your filing and database needs. There's no need to purchase expensive, separate options, since EasyFiler includes everything you need in one package, for one price. With EasyFiler you enter, change, sort, and retrieve the exact information you want.

EasyFiler is PC/DOS based, and thus can be stored on a hard disk of up to 40 megabytes. That's not only a great increase in storage capacity, but it also allows for much faster information retrieval. EasyFiler will hold up to 10,000 individual records, with space for 1000 characters per record.



EasyFiler has a number of features which will help you increase the power and performance of your IBM PC. It is compatible with BASIC, which means you can transfer information to or from an IBM BASIC file. EasyFiler also includes a built-in calculator, which enables you to compute data during the entry of information or during report generation. Through "Soundex," another built-in feature, you can retrieve information even if you don't know the exact spelling of a word.

EasyFiler works with other EasyFamily programs. All IUS programs have similar instructions and make full use of the IBM PC keyboard. Integration of information from one IUS program to another is easily accomplished. For instance, you can use EasyFiler with text written on EasyWriter II, the advanced wordprocessing

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You'll find EasyFiler and other IUS products at ComputerLand and authorized IBM dealers. For more information call (415) 331-6700 or write Information Unlimited Software, Inc., 2401 Marinship Way, Sausalito, CA 94965.



Foolscap's Future

Sooner or later everyone's life is touched by the law. When personal computers affect the practice of law, they affect us all.

In an age of personal computers it is a sure bet that legal documents will be created on video screens and stored on disks instead of on the traditional foolscap paper. This alone may have a noticeable impact on legal draftsmanship, fostering greater precision, customization, and originality. Beyond this straightforward evolution lies the possibility of much more subtle, yet far-reaching, change.

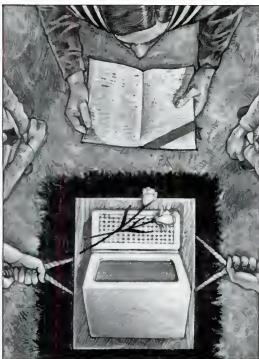
Legal documents of certain types have a surprising element of kinship with computer programs. As legal papers and the people who draft them become more intimately involved with personal computers, hybrid creations incorporating qualities of both a program and a legal document may emerge.

In essence, the average contract is already one long sequence of IF-THEN statements that spell out the consequences of alternative events or actions. "If you fail to make the payments... THEN we will..."

Similarly, for a last will and testament: "If my wife Agatha dies before me... THEN I bequeath the family jewels to my faithful secretary Monique..."

With traditional legal papers, the parties involved with a document are required to perform their own evaluation to conclude which of various conditional provisions are satisfied at any given time and what results follow. In the future, however, the conditional provisions might be structured as a program on a disk, with the computer doing the evaluation work.

Imagine that your rich uncle Montague has passed on to his final reward. You gather with the rest of the family at his attorney's office for the reading of the will.



From his safe, Lawyer Wise produces an envelope sealed with ribbon and red wax. Breaking the seal, he pulls out...not a sheaf of foolscap, but a single floppy disk. In full view of all, he inserts it in the IBM Personal Computer on his credenza and presses the auto-start keys.

On the PC's screen in glowing green appear the words: "Last Will And Testament of Montague Gotbux—(press any key to proceed)." Wise touches the space bar. The screen changes to say, "First, some questions. What's the current value of all my liquid assets?" Wise taps in a seven-figure sum.

"Is my wife, Agatha, still alive?" asks the screen, adding parenthetically that the Y key can be used to answer yes and the N key to respond in the negative. Wise types Y, then Y again to the subsequent query,

"And were we still married at the time of my death?"

"What about my son, Casanova? Is he still alive? And did he graduate from college?" When Wise keys in a Y to the last question, a further query appears: "Indeed! That's a surprise. What was his grade point?" Cautioning young Gotbux that a transcript will be required to verify his response, Wise types in the number the son tells him.

"And which of these other people remain alive?" inquires the screen, producing a list of other relations and friends. Wise taps in the responses: mostly Y's, a few N's.

The question-and-answer session proceeds a bit longer with answers occasionally producing droll comments by old Gotbux from beyond the grave. At last the screen flashes: "One moment please while my will is prepared." The printer to the computer's left comes to life and begins to spew out a document reprising the heading that appeared on the screen at the

session's beginning: "Last Will And Testament of Montague Gotbux."

The emerging document is free of all contingent clauses. It makes no bequests to people who predeceased Gotbux. It neatly apportioned bequests according to Gotbux's actual assets at the time of his death. The share going to young Casanova Gotbux is precisely calculated as a function of his grade point average at graduation (had he become a dropout, his share would have gone to endow a scholarship fund instead).

This imaginary scene is somewhat tongue in cheek, but the underlying principles are very serious. Someone making a will could easily construct it to be responsive to the conditions in effect at the time of his death. Contracts governing complex transactions among businesses could be drafted to crunch all the complexities

Software Breakthrough...

NEW QUIKPRO + PLUS WRITES PROGRAMS FOR YOU IN MINUTES ON YOUR Micro

Technical Review
by Wayne Hepburn

QUIKPRO + PLUS is a new breakthrough in software for microcomputers from ICR-FutureSoft.

Until now, whenever you wanted a new separate program in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic), you had to spend a lot of dollars for it, or a lot of hours creating it (if you have the know-how). That's all in the past now.

Anybody who can turn on a computer can write a program, quickly, with this new Quikpro + Plus software which generates programs for you. Quikpro + Plus is the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you to tap the real power and speed of your microcomputer, and it is about time this happened.

I interviewed him to find out more about Quikpro + Plus and pass this valuable information to you. He told me "The best part of this software is that it gives you a separate custom program every time you use it. The resulting program is produced, error-free, in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic, as appropriate to your system) for you by Quikpro + Plus. What's more, you can list your new program, look at it, see what makes it tick, and modify it as you wish."

You can also, customize, enhance, alter, and even copy the programs you create with Quikpro + Plus. This is because programs created by Quikpro + Plus are structured, easy to follow, and include many REMARKS statements right in the program listing. I don't know of any other software with the flexibility and ease of use I found in Quikpro + Plus.

HUNDREDS OF APPLICATIONS...

For Education, Business, Hobby, Home, Science, Personal, etc. a partial list includes programs like these: Financial Forecasting, Expense Planning, Data Access and Retrieval, Modeling, Record Keeping of all kinds, Statistical Data Banks, and much, much more. Quikpro + Plus cuts the time it takes to generate a new custom program down to a few minutes. That's true. I saw a

letter from a user who created a separate program in Basic within fifteen minutes after reading the clear, simple, complete Documentation & Operating Manual for Quikpro + Plus. The software will generate File Handling and Data Entry Programs in a file format, drawn right on the screen by user. Programs created by Quikpro + Plus produce standard ASCII Data Files allowing data to be easily accessed by other programs, other micro's, and even main frames.

HOW IT WORKS...

The operation of Quikpro + Plus is simple and easy. On your screen you answer questions which appear in plain English. The answers generate error-free Filing & Data Entry Programs for you...instantly. This completely eliminates the tedious and time consuming development you normally go through to write a program. Since the instructions are right on the screen you don't need any programming skills to operate Quikpro + Plus. Quickly, you get a fully independent new program ready to run on your system. After you create the new program you can remove Quikpro + Plus and stick it on the shelf until the next time you create a custom program.

PRINTS REPORTS & MANUALS...

There is a full report printing capability put into your new separate program by Quikpro + Plus. You can even print out in formats different from the File Format you used without altering the Record Data. Or you can selectively print portions of Files or selected fields from selected Records. Just about anything you want can be reported out from the Data Base associated with the new custom program you wrote.

PERFORMS CALCULATIONS...

You can perform all manner of computations among various fields in each record. You can selectively calculate and print resulting data only, or Data Base and results, or alter Records by calculation results, and so forth. The possibilities seem unlimited. And keep in mind that the power and features I am talking about end up in the separate new custom program Quikpro + Plus writes for you.

This software is ready to ship immediately

and you can start writing programs the day you get in. In fact, ICR-FutureSoft guarantees your satisfaction or you can return it for a full refund in ten days after delivery. How's that for confidence? Mr. Tamargo said "There isn't any risk to us...our product works like it's supposed to work and users are very well satisfied. We are glad to guarantee satisfaction."

You get Quikpro + Plus by mail or phone directly from ICR-FutureSoft. Just write them, or call their Toll-Free phones and specify your model and version requirements from the list that follows:

For CP/M with Microsoft Basic \$259

(same as MBASIC/Basic 80)

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For MS/DOS Operating System \$259

IBM/PC • WANG

For TRS/DOS Operating System

Radio Shack TRS80 Mod I, III \$149
Radio Shack TRS80 Mod II, 16 \$189

For ATARI Microsoft Basic \$189

For OASIS Operating System \$349

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Send check or money order (Florida residents add 5% tax) to ICR-FutureSoft, Box 1446-PD, Orange Park, FL 32073 or if you have Visa or Mastercard, call Free 24 hours daily, seven days a week...

1-800-824-7888 ask for Operator #120
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Software Dealers can handle this software. Contact ICR-FutureSoft Customer Service at 1-904-269-1918 or write.

through the computer, producing a cut-and-dried synopsis of the provisions relevant to the exact conditions that apply at a given moment. By extension, a contract drafted in program fashion would let lawyers and clients do what-if analysis of the same type that financial managers do with spreadsheet programs. ("Suppose we waive our right to invoke the penalty clause and then later change our minds?")

The process of drafting such program/contracts might, as a secondary benefit, encourage more thorough analysis by their drafters. The disciplines of structured programming and "top-down" design might appear in law school curricula.

HYBRID creations incorporating qualities of both a program and a legal document may emerge.

As the trend to integrated systems advances, each legal document with provisions dependent on calendar dates might generate automatic tickler entries in an attorney's electronic datebook. (A lawyer comes into his office to find his PC screen noting: "If General Widget didn't meet its first quarter quota by yesterday, you now have 10 days to advise the company which of the alternative remedies you wish to invoke. Would you like to draft a letter?")

One type of document particularly well suited to drafting in program form is the "living will," which attempts to state the wishes and directions of an incapacitated person regarding his affairs. In attempting to resolve such questions as whether life support machines should be turned off at some point, a living will may ask those acting on the subject's behalf to resolve complex, interrelated matters in coming to a decision. Here, even more than elsewhere, the business of determining and honoring a person's wishes may be made to run smoothly by a document created for a disk instead of foolscap. /PC

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PC-Communiques

A compendium of facts, news, opinions, gossip, inside intelligence, speculation, and forecasts about IBM Personal Computers.

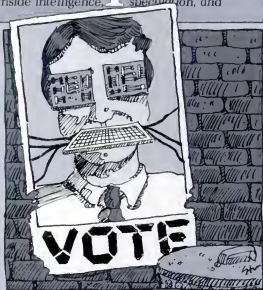
Another Alliance for Intel and IBM

The PC's 8088 microprocessor represents one happy marriage between Intel and IBM, and a new agreement between these two electronic giants looks like the beginning of another such alliance. In this latest arrangement, Intel will provide IBM with design and production information for a 64K RAM chip, and IBM will be able to manufacture the chip for use in its computer equipment.

The chip in question is a second-generation device from Intel, the 2164A. IBM probably will produce these chips at its Burlington, Vermont, facility, where other IBM 64K chips are manufactured. IBM has not revealed which of its products will utilize the 2164A chip or whether it is being considered for the PC.

Displaywriter Program for the PC?

Although this development has not been announced or confirmed by IBM as PC-Communique goes to press, our sources report that IBM has completed work on a new word processing program for the PC. This program is reputed to be an adaptation of the software used in IBM's well-known Displaywriter word processor, and it has been configured to operate in PCs with 64K of RAM. (This 64K operation, if true, is a notable achievement because such independently produced word processing programs as WordStar and Volkswriter are severely limited in 64K machines.) Our sources suggest that IBM will market this new program beginning early next year.



Computers in Congress

If you write your congressional representative these days, your reply may come from a computer. In a service gaining popularity among members of Congress, a computer time-sharing firm named Dialcom offers senators and representatives a kind of super word processor that contains a library of boiler-plate paragraphs about the political topics and questions that voters raise most often. A member of the congressperson's staff can compose a letter by calling up the appropriate paragraphs, adding a personal comment or two and the pertinent name and address, and having the letter printed.

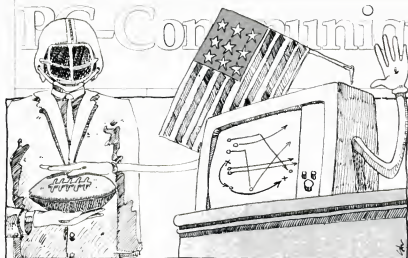
Another useful part of this service is that the congressperson's electronic correspondence is then stored in the Dialcom computer, and if a voter phones or visits the congressional office, staff members can bring up that voter's file on-screen to prepare their boss for an informed conversation with the constituent. So far, though, nobody is suggesting that the computer poll all the voters' mail and tell the politicians how to vote.

Stopping Computer Grime

A new firm called LoTech Ltd. is creating practical products such as a light touch, LoTech's first offering is Patch Computer Bug Sprayer, an aerosol spray for removing dirt, fingerprints, and other debris from computer display screens.

During spray, while perfectly useful, may signal the beginning of a new trend toward fun in computing. At least some of the industry's offerings seem promising. May drown floating points in a "box conditions." "Not to be taken seriously." If LISP (pronounced "administer artificial intelligence immediately") Not yet (to be administered). Contact LoTech Ltd., P.O. Box 6270, San Francisco, CA 94109.





Football, Lawsuits, and the PC

Several legal actions have resulted from the complex situation surrounding the former Oakland Raiders' move to Los Angeles. Although recent court decisions have now cleared the way for the Raiders to play in Los Angeles (when the players aren't on strike, that is), the team had been trying to make the move for 2 years before its legal path was cleared.

One lawsuit still in litigation involves the 2 years the Raiders played in Oakland, and the Los Angeles Coliseum was empty on Sundays because the Rams had departed for an Orange County stadium and the Raiders had been blocked from moving south. The plaintiff in this civil suit is the Los Angeles Memorial Coliseum Commission (along with the Raiders) and the defendant is the National Football League.

In what may well be its first legal entanglement (so to speak), the PC is helping to analyze data for one of the parties in this lawsuit. One of the lawyers representing the NFL, Patrick Lynch of the firm of O'Melveny and Myers, has hired experts at Arthur Andersen & Company, a major accounting firm, to provide

computer analysis of the extensive financial data involved in the claims for damages in this case. Staff members of Arthur Andersen's Los Angeles office have used the PC and VisiCalc to provide "what if" analysis for variables in some 40 categories of damage claims.

The Coliseum and the Raiders are claiming that if the Raiders had played in Los Angeles during the 1980 and 1981 seasons, the Coliseum could have sold X

number of seats for each home game, for a total of Y dollars. The NFL may wish to challenge the Coliseum's assumptions about how many seats would have been sold for each game. Such a challenge would result in different dollar totals. This is just the kind of calculation and recalculation job VisiCalc does handily, and the Andersen staff is providing the NFL's legal team with on-the-spot financial data for

any such variables that come into play in the courtroom.

The PC will probably not appear in court. Phone lines in the courtroom will link legal staff with experts in the Andersen offices, where instant computer calculations can be made. Even if the PC doesn't "testify" in person, it looks as if the days of instant replays—computer style—have begun.

On-Line Newsletters

A new service called NewsNet offers anyone who has a computer, modem, and communications software access to 100 or more newsletters. Subscribers pay fees from \$24 to \$120 per hour for each publication they read; NewsNet does not have an initial subscription fee, but the minimum monthly charge is \$15.

For PC users who need up-to-date information in specialized fields, NewsNet could be an advantage over conventional subscriptions to newsletters: PC users would not have to wait for the publication to arrive in the mail, and they could browse or search for specific items at a lower cost than by mail subscription rates. This service is available Monday through Friday from 8 a.m. to 8 p.m. EST.

The special interests and industries covered by NewsNet vary. Categories include advertising, aerospace, automotive, chemical, electronics and computers (nine newsletters), entertainment, environment, finance, government, real estate, research and development, taxation, and telecommunications (20 newsletters). Each category is covered by at least one newsletter and all are inside-the-industry publications not sold on newsstands.

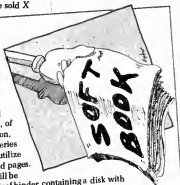
For a subscription application

Publisher Plans Softbooks

Howard W. Sams Company, publisher of conventional computer books, and Expert Systems, Inc., of Redmond, Washington, have announced a series of "softbooks" that utilize software and printed pages.

Each softbook will be packaged in a looseleaf binder containing a disk with the principal part of the book and an explanatory text designed to augment the information on disk. The first three titles in this series are scheduled for release this month: Executive Planning with VisiCalc, Executive Planning with Multiplan, and Executive Planning with SuperCalc. All three softbooks will be available for the PC.

For more information, contact Howard W. Sams & Co., P.O. Box 7092, Indianapolis, IN 46206, (317) 298-5566.



and a complete list of available newsletters, contact NewsNet, 945 Haverford Rd., Bryn Mawr, PA 19010, (800) 345-1301, (215) 527-8030 in Pennsylvania.

Displaywriter Gets p-System

IBM already distributes the UCSD p-System, an operating system for the PC. Now the firm will be offering the p-System for the Displaywriter as well. The Displaywriter is IBM's popular 16-bit word processor, which was designed originally as a dedicated system that used only IBM software. The recent trend in office electronics has been to broaden the applications for such equipment, however, and IBM has joined this trend.

Earlier this year, CP/M-86, the operating system from Digital Research, became available for the Displaywriter, and now the UCSD p-System offers another alternative. The p-System is available in two configurations: a run-time system for using applications software and a development system that supports several languages for developing software. Technical information and support for the p-System will be provided by SoftTech Microsystems, 9494 Black Mountain Rd., San Diego, CA 92126, (714) 578-6105.

Ah-One, Ah-Two...

The PC has become prime territory for a new generation of software—integrated programs. First there was Context's MBA, which sports spreadsheet, data base, graphics, word processing, and telecommunications functions in one package. Now there's a new entry in the all-in-one

"The computer is the Proteus of machines. It can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes."

—Seymour Papert
Mindstorms: Children, Computers,
and Powerful Ideas

program sweepstakes—or actually, all in 1-2-3, the name of this integrated package. Produced by Lotus Development Corporation of Cambridge, Massachusetts, 1-2-3 is designed for speedy operation and easy learning; it includes an on-screen tutorial, utilizes the PC's function keys for cursor-control

commands, and bypasses some of the more confusing or tedious DOS commands.

According to Lotus President Mitch Kapor, this integrated program features a large-capacity spreadsheet component (2048 rows by 256 columns, with storage space of 500K), text editing, data base management, and impressive graphics. Kapor is the

creator of VisiPlot and VisiTrend, two graphics components that work with VisiCalc. His new 1-2-3 package can translate numerical data in the spreadsheet part of the program into bar graphs or pie charts or plot the locations of X, Y coordinates. The program operates with both color and monochrome monitors and supports color printers and plotters that are compatible with the PC.

1-2-3 will be available in late January. The package will sell for \$495 and requires a PC with 128K, two disk drives, and PC-DOS.



Computer Insurance

Doctors have it, lawyers have it, architects have it, and now programmers can have it. What is it? Malpractice insurance. At least one insurance company—the Chubb Group—now offers an errors and omissions policy to software developers. Hardware manufacturers are also adding similar coverage to their product liability insurance, so their clients may be compensated for loss of income that results from hardware breakdown.

Hardware and software creators aren't the only ones being aided by the new trend toward computer insurance, however. Various policies are also available to PC owners who use their computers for business and personal purposes. At least two of these policies protect both equipment and the data it manipulates and stores.

One of these new insurance programs is offered by the Kemper Group. Called the Business Electronic Equipment Policy (BEEP), this insurance covers loss or damage to the

computer and peripherals and to "active data processing media." This includes situations in which the equipment is in transit for servicing or transfer to another location, damage while being serviced, damage from electrical disturbance or extremes in temperature, and protection from losses resulting from employee dishonesty.

For people who use their PCs at home but not as part of a business, the Chubb Group offers supplementary coverage to a homeowner's or tenant's policy to protect personal records stored on computer media.

This whole new arena of computer insurance is enjoying nearly as big a boom as computers themselves. One computer insurer, The Hartford, wrote about 200 computer policies in 1979, but this year the firm expects to write 5,000 such policies. This new form of protection will result in an estimated \$200 million in premiums per year.

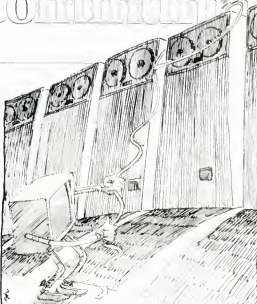
For information about these and other computer policies, contact your insurance agent, an independent agency that handles Kemper or Chubb insurance, or Ralston Eng. MPA Insurance Services, P.O. Box 5578, San Mateo, CA 94402, (415) 572-8591.

PC-Communities

PC-Mainframe Connection

IBM has announced three new software products for PC communications. Two of these packages are designed to link the PC with mainframe computers by emulating popular IBM terminals; the third is an upgrade of the existing asynchronous communications program.

The more comprehensive of the mainframe communications packages supports two modes: emulation of the widely used Systems Network Architecture (SNA) 3270 terminal or the SNA 3770 Remote Job Entry (RJE). In the SNA 3270 mode this software provides user-definable 3270 keys, EBCDIC line transmission support, a local print key, and status line messages. In the SNA 3770 RJE mode, the software provides ASCII or EBCDIC line transmission support, logical unit type 1, and outbound host compression. These emulations



both support transmission rates of up to 4800 baud.

This software requires a PC with at least 128K of RAM, one single-sided disk drive, the new Synchronous Data Link Control

(SDLC) communications adapter board from IBM, a special cable for the SDLC card, a modem, an 80-column display, and PC-DOS 1.0 or 1.10. The package will be available for \$700 at IBM Product Centers in January. The special SDLC communications board and cable will also be released at that time; the board will cost \$300 and the cable will cost \$75.

The second PC-mainframe software package from IBM emulates the IBM 3101 terminal. This program is less sophisticated than the SNA package, but it provides user-specified line characteristics and keyboard mapping, sample specification files for commonly used configurations of the 3101 terminal; transmission of ASCII files to and from a host computer and local storage on disk; and conversion of ASCII files to and from binary format.

Among the specification files provided are VM/370, MVS/TSO, IBM 7426 Terminal Interface for IBM 8100 series mainframes, and 3101 pass-through. This program requires a PC with at least 64K of RAM, one

disk drive, the standard communications adapter, an 80-column display, a modem and cable, and PC-DOS. This software will be available for \$140 at IBM Product Centers in January.

The third communications software package is version 2.0 of the Asynchronous Communications Support Program. This upgrade includes the following enhancements to version 1.0: menu-selectable options for The Source and Dow Jones News/Retrieval, file transfer capability between a PC and most host systems, a utility program to convert files from ASCII to binary and vice versa, and options to print data being received or store it in a temporary file. The program is available now for \$60. Although this product is an upgrade of the earlier version, PC users cannot exchange version 1.0 for credit toward version 2.0. A detailed listing of features for all of these new products is available from authorized PC dealers.

Computer Charisma

I've ignored M.A.S.H. and Dallas, played hookey from class. Call me "junkie"—I know what you mean; My addiction is worse than cocaine, booze, or grass. For I'm hooked on a silly green screen.

All my library books lie unread, overdue. And the laundry's turned mildewed and green. We've had fast food for dinner six nights in a row While I work this hypnotic machine.

You can say he's not human; I'll argue that fact From his sensual beeps late at night. He'll do graphs, amortize, play a tune, plot a tract. While I watch in astonished delight.

He revises, deletes, and aligns his display. He seduces with flashing green men— Yes, I'm leaving my husband and running away To Brazil with this silly machine!

—Bunny Hammersla

PC-Communikes Pays

Do you have news, gossip, or unusual computer tales for PC-Communikes? We will pay up to \$50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to editing. Our User-to-User section also publishes and pays for readers' submissions; that section features tips, problem solutions, and short programs or routines. Please send submissions to the appropriate department—PC-Communikes or User-to-User—at PC, 1528 Irving St., San Francisco, CA 94122.

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PC Tutor

The 8087 microprocessor, color and monochrome adapters, freeze-up in Debug. What to do? Here are some suggestions.

The 8087

Q: What is an 8087 and how can I use it in my PC?

Marshall Levy
Hollywood, California

A: Because the 8086 has 16-bit registers internally, it is considered a 16-bit microprocessor. Likewise, the 8087 can be considered an 80-bit microprocessor since it has 80-bit registers.

Operating an 8087 with the 8086 is very simple. Plug the 8087 into the spare socket next to the 8086 on the PC's main circuit board. The software reacts as if a number of new instructions had been added. These instructions let you manipulate the following data types:

Byte Integer	(8 bits)
Word Integer	(16 bits)
Short Integer	(32 bits)
Long Integer	(64 bits)
Packed BCD	(80 bits)
Short Real	(24 bits)
Long Real	(64 bits)
Temporary Real	(80 bits)

If you are not using the temporary real data type, the 8087 will automatically convert your numbers to temporary real. This can eliminate round-off error in many



is saved by using an 8087, Table 1 compares times for an 8086/8087 pair with those for an 8086 alone performing the operations in software. The numbers in the table apply to double-precision real numbers. Time savings for integers, particularly short ones, are less.

Because of the 8-bit data path on the 8086, the times for an 8086 should be much larger than the 8086 times in the table, while an 8086/8087 pair would be comparable to the 8086/8087 combination.

You may be wondering about the switch referred to on page 11 of the system board schematic as N.P., for numeric processor (switch 3 of S1 on the system board).

error message.

Some people recommend using matched 8086/8087 pairs, and Intel has supplied them as matched sets. Theoretically, this should not be necessary.

Bugged by Debug

Q: My Debug program has a tendency to freeze up unpredictably. Why does this happen and how can I fix it?

Phyllis Tawa
North Kingston, Rhode Island

A: The Debug program distributed with both PC-DOS and MS-DOS has a serious flaw. If at the same moment as a tick of the real-time clock occurs you issue the Trace command and press Return, Debug will attempt to trace the wrong instruction. You end up staring at a display of the first instruction in the timer routine (an STI instruction at location F000:FE6E) and at a totally defunct computer. The only fix is a power down/up sequence. This happens to me consistently.

Monitor Matters

Q: Why are the IBM color/graphics adapter and monochrome cards incompatible?

Todd W. Hansen
Orangepark, Florida

A: All monitors and TVs work the same way: Many times a second an electron beam scans horizontally across the screen. The beam pulses on or off (or changes colors), depending on changes in the strength of the video signal. The beam continues scanning across the screen, moving down each time it finishes a line, until it reaches the bottom—at which point the whole process repeats.

The number of times a second that the beam moves across the screen is called the horizontal scanning frequency. The number of times a second that the whole display gets updated is called the vertical scanning frequency or, more commonly, the refresh rate.

Table 1: Run-time comparison

	8086/8087	8086
multiply	27 microseconds	2,100 microseconds
compare	9	1,300
square root	36	19,600
tangent	90	13,000

circumstances. Note that you can instruct the 8087 to perform operations at other precisions for compatibility with different processors.

The instruction repertoire of the 8087 is comprehensive; it includes add, subtract, multiply, divide, square root, tangent, power, log, and various comparison functions.

To give you an idea of how much time

The 8087 does not require that this switch be turned on. In fact, if you do turn it on, you will probably get a parity error message. This switch connects the 8087's interrupt line to the nonmaskable interrupt (NMI) line of the 8086. The 8087 will interrupt the processor when an overflow, such as divide by zero, occurs. This is not necessary. The memory parity error line also goes to the NMI, offers a possible parity

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The color card is designed to work with a standard TV set. TV sets have a horizontal frequency of 15,750 Hertz (scans per second) and a refresh rate of 60 times a second (30 if the monitor uses interlace, but that's another topic). A refresh rate of 30 or 60 Hertz meshes well with household power line frequency so that fluorescent lights and power supply problems do not cause visible lines, or interference bands, on the screen.

The monochrome card is designed to work with the monochrome display, which runs at entirely different frequencies from a TV. The horizontal scanning frequency of the monochrome display is 18,432 Hertz, and the refresh rate is 50 Hertz. To eliminate interference bands, the monochrome display uses a long-persistence phosphor that causes the image to stay on the screen longer than it does with a color display.

As a result of its higher scanning frequency and lower refresh rate, the monochrome display can show 350 lines, while color adapters are limited to about 240 lines (15,750 scans per second divided by 60 screens per second gives 262 scans per screen, but some time is needed for the scan line to return to the top of the display).

The registers of the 6845 display chip on the color card can be set to run at the right frequencies for monochrome (both cards use the same chip), but the dots that form characters will be much longer, and only 546 dots (or 68 characters) will fit on a line. The characters will look short and stabby.

Color TVs and RGB hobbyist monitors are not able to translate a video signal into images as rapidly as similarly priced high-quality black and white displays can. This means that a good monochrome display can show more dots per line than a color monitor of similar quality.

The monochrome display can show 720 dots per horizontal scan line, while the color adapter is limited to 640. This is because the monochrome card runs faster (16.257 MHz versus 14.3 MHz on the color card), taking advantage of the better bandwidth of the monochrome display.

IBM claims that the power supply on the monochrome display will be damaged if you use it with the color card.

If you want to read more about this, refer to the Cheap Video Cookbook by

IBM PC owners... have your cake and eat it too!

ConvertaBuffer

Don Lancaster (Howard W. Sams & Co. Inc., Indianapolis, \$7.95) or the Motorola 6845 Specifications Sheet.

Disk to Disk

Q: Why does it take so long to transfer many small files from disk to disk?

Daniel Kindlon
Wheaton, Illinois

A: The IBM PC power supply is too small to power two drives at once. When you transfer a file from one drive to the other, the operating system has to turn off the first drive and wait for the second drive to get up to speed. When the transfer is complete, you have to wait for the first drive to get back to speed to read the next file, and so on.

When writing to a new drive, the operating system waits 1/2 second for start-up (see p. A-35 of the Technical Reference Manual). This delay means that transferring 20 files takes at least 10 seconds, no matter what.

RAM Disks

Q: I have read a lot of advertisements and comments on something called RAM disks. What is a RAM disk, and why should I get one for my PC?

Martin Taylor
Boston, Massachusetts

A: The RAM disk (also called a memory disk or speed disk) has to be one of the all-time great inventions. A RAM disk is a machine language program that fools the DOS into believing that a portion of RAM

THE RAM DISK
has to be one of the all-
time great inventions.

is actually a disk drive. You can store programs and files in a RAM disk exactly as if it were a normal disk, but a RAM disk can read and write information much more quickly. Programs like WordStar that use the disk to store parts of themselves will run much faster when used with a RAM disk.

The biggest disadvantage to a RAM

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21

Easy-to-install ConvertaBuffer comes with built-in cables which plug directly into your PC's printer adapter and your printer's serial interface without removing the cover of the system unit.

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disk is that you must remember to copy the data onto a real disk before you turn off the machine. If the power to the computer fails, you will lose all the changes you have made since the data was last stored on disk.

Besides being faster, memory disks have no mechanical problems. Using a memory disk should noticeably extend the life of your disk drives. The average time required by a normal floppy disk to seek to a particular spot on a disk is about 120 milliseconds; with a memory disk, the seek time is zero milliseconds. I use one constantly and would be lost without it.

You will need 160K of RAM to simulate

Consider this example: $A = B/2$. An interpreter can determine whether B is an even integer (in which case A will be an integer), while the compiler must be told what form the programmer expects A to take because the value of B is unknown at compilation time.

One very nice feature of a well-written interpreter is that for debugging, you can stop the program at any time, examine the values of the variables, change them if you wish, and then continue. Some interpreted languages, like APL, even let you change the program while it is running.

UCSD Pascal falls into a gray area. It does some of the translation ahead of

time, producing what is called pseudocode; then the pseudocode is interpreted during execution. /PC

Mark Zachmann is a systems analyst and electrical engineer. He is a faculty member at Georgia Institute of Technology, College of Management, and specializes in computer communications.

PC Tutor answers your questions and solves practical problems of general interest. If you would like to have your questions answered, drop a line to PC Tutor, PC, 1528 Irving St., San Francisco, CA 94122. You may also send your questions through The Source: ST0948.

YOU WILL NEED 160K of RAM to simulate a single- sided disk drive.

a single-sided disk drive, so you should have at least 288K (160K for the memory disk and 128K for the programs) in your PC to use a memory disk. My PC has 576K; I use it to simulate a double-sided drive.

Note that if you have a memory disk, the need for the second real disk drive evaporates. If you are tight for cash, I suggest that you buy more memory, rather than a second drive.

Compilers vs. Interpreters

Q: What is the difference between a compiler and an interpreter?

Robert Ferlanti
Caldwell, New Jersey

A: Basically a compiler takes a text file (the program you write) and converts it into a machine language program. That machine language program must be executed later by the microprocessor. An interpreter is a translator that reads each source statement and performs the required operation. Interpreters can be much more casual about variable type definitions (integer, real, character, etc.) because an interpreter can work in context. A compiler must translate everything out of context.

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A little homework will prove useful in getting the right software package for your needs.

How To Shop For Educational Software

While computers will never replace human teachers, the right software enables the PC to become an effective teaching tool. Good educational software can present lessons, drill and test students, tutor them in problem areas, simulate experiments, and keep teachers' records, allowing teachers to concentrate their efforts where they are most needed. Poor or inappropriate educational software, however, may be an expensive ticket to frustration.

Although educational software has only recently become available for the PC, prospective buyers face a bewildering array of choices. The following questions and answers provide guidelines to help parents, teachers, and students decide which software packages make the grade.

What is the main advantage of using educational software?

Educational software provides the opportunity for self-paced learning. The student controls the speed at which the lesson is presented, the lesson's content, and the difficulty of the material. Software can be programmed to determine from students' answers whether they understand the concepts. If they don't, questions can be rephrased, explanations of the material can be presented differently, or the difficulty of the whole lesson can be changed. The term interactive is used to describe this type of program.

Studies on computer-aided instruction (CAI) conclude that students using CAI learn as fast as or faster than students taught by traditional methods. (For one

such study, see G.P. Kersley's "Some Facts About CAI: Trends 1970-1976," *Journal of Educational Data Processing*, 1976.)

What subjects can computers teach?

Almost any subject that involves repetition, simulation, or memorization can be taught with educational software programs. Software for microcomputers is available or is being developed to teach such subjects as math, science, simple English usage, touch-typing, languages, and speed reading. The most popular software packages teach computer literacy and programming skills.

I**INTERACTION**
with the program
through the keyboard
provides more
physical involvement
than reading a book.

What are the different types of educational software?

Three broad categories can be distinguished: drill and practice, tutorial, and simulation. Drill and practice programs work best for subjects that require repetition and memorization, such as math and spelling. Tutorial programs are good for

subjects that require long, detailed explanations, such as language arts. These programs give examples that illustrate a concept. They question the student on various aspects of the subject and offer explanations.

Simulation software is used for subjects that require practical experience, such as pilot training. Computer simulation enables novices to practice procedures that would otherwise be expensive or dangerous. Computerized chemistry experiments, for example, safely simulate explosions or the properties of rare or expensive chemicals.

Is educational software for kids?

Educational software is designed for all age-groups. Adults can buy programs as substitutes for more expensive and time-consuming night school or correspondence courses. Some of the most appealing software for children combines game elements with instruction.

Educational software packages should indicate the age-group for which the product is designed. Although this information provides potential buyers with an idea of who would benefit most from the software, it is a good idea to investigate the product. Find out exactly what the program is teaching and make sure the intended users know enough so that they will not be lost from the beginning of the lesson. Software for young children should not make the student use the keyboard extensively. Avoid a product that

teaches students something they already know.

Educational software is obviously challenging for the whiz kid, but what about the slow learner?

If lack of motivation is part of the learner's problem, computers should help, because a good educational program is designed to be fun. Interaction with the program through the keyboard provides more physical involvement than reading a book, so the student's attention doesn't wander as quickly.

The student needs to learn how to use the computer, so the patient assistance of a parent or teacher will be necessary at first.

How dependable is the material taught by educational software?

Reputable software publishers realize that it is essential to present accurate, up-to-date information in their lessons. They go to great lengths to test, modify, and retest their products. Most of the educational software available today is accurate, but buyers should follow up on software reviews, see product demonstrations, and pay attention to publishers' reputations.

Can computers help keep teachers' records?

Many software packages use a concept known as computer-managed instruction (CMI) to assist teachers in monitoring students' work. Programs with CMI keep track of each student's test scores, which questions he or she answered correctly or

tion to purchase this feature in add-on software. Software that does nothing but CMI is also available.

What are the system requirements of educational software for the PC?

Most educational software on the market today takes advantage of the PC's color/graphics capability and requires a color/graphics adapter and a color monitor. Three types of color monitors are available for the PC: composite, RGB, or a TV with an RF modulator. TV sets have the poorest resolution but are the least expensive. Composites are sufficient for users who require medium resolution only and will settle for 40-column text (80-column text is usually illegible on a composite). Composites sell for about \$300. Users who want an 80-column display and high resolution for charts and graphs will have to pay upwards of \$600 for an RGB monitor.

Memory requirements vary among software products and should be printed on the package. The normal requirement of educational software for the PC is 64K.

Some products require double-sided disk drives, but many are flexible enough to run on systems with either single- or double-sided drives.

What are some things to look for when choosing educational software?

Review the documentation carefully and ask for a program demonstration whenever possible. Operating instructions in both the documentation and the software should be clear and concise. Educational software users are often children, so make sure the operating instructions are comprehensible to the child. Check the documentation for incorrect grammar; if the documentation is poorly written, chances are that the program itself will use poor grammar.

Software should always let users know where they are in the program. If you want to test software for user-friendliness and a demo disk is available, try running a program without reading the documentation.

A good educational software package should have concrete teaching objectives. Make sure the documentation details exactly what will be taught and that the level of proficiency the user will attain is stated in a measurable way. A goal of a certain number of words per minute would measure proficiency in a typing course, but in a

math course success might be defined in terms of a certain test score.

Won't children destroy disks or programs as soon as they use them?

Because floppy disks are not invulnerable, children have to be taught to use them properly. Good programs, on the other hand, do not allow the user to break the system simply by fooling around with the keyboard. Look for the phrase "user-

COMPUTERIZED chemistry experiments safely simulate explosions.

proofed" in the documentation. A user-proofed program does not allow the user to interrupt the flow of the program by hitting keys at random. In the industry, designers call user-proofing "the old elbow on the keyboard test."

What if the disk won't work or the program has a bug?

The willingness of software publishers to respond to consumer complaints varies, so check the product's documentation for warranty support. The documentation may list an address or a hot-line number. If not, return the product to the dealer who sold it to you. Before buying software, remember to check the store's and the manufacturer's return policies. Try to buy products with warranties.

What is the best way to keep track of the latest educational software developments for the PC?

Look for advertisements and software reviews. Educational periodicals such as *The Journal and Electronic Learning* are excellent references for new software products. Computer publications, though less specialized, frequently review new educational software. Checking with user groups is another good idea. /PC

Douglas Q. Cobb is an educational analyst/programmer for DesignWare, Inc., a courseware development company based in San Francisco.

SOFTWARE for young children should not make the student use the keyboard extensively.

incorrectly, the amount of time spent on the computer, and the lessons on which the student is working. The information stored on each student's disk may be used by teachers to help determine grades. Some educational software packages include CMI and others give users the op-

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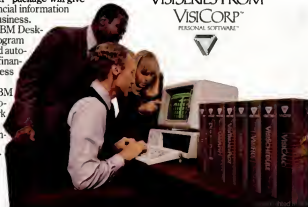
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A young gameware company, an advertising agency, and a famous gambler discover new opportunities in the Land of the Personal Computer.



Hot Deal: Blackjack Software Goes To Market

With your IBM PC you have the tool to exercise the creative genius of an Edison, a Ford, or a Bricklin/Frankston, the inventors of VisiCalc. But unlike traditional inventors, you don't need to hire white-robed assistants, order chemicals, or build a factory. All you need is a software concept, a PC, and the right components to plug into it.

Nothing sparks creation like recreation. The urge to show people a good time leads many computer pioneers into the barely charted wilderness of computer games. Back in the early days of personal computing—in the late '70s and very early '80s—marketing software was simple. Entrepreneurial programmers just put their disks into a baggie and sold them through the mail. Or they sold them to distributors and waited for royalties.

But that's changing. Gameware creators will have to get sharp with their marketing or sell to developers who already have marketing savvy. With a good product, either choice may make a fortune. The difference is mostly in the risk.

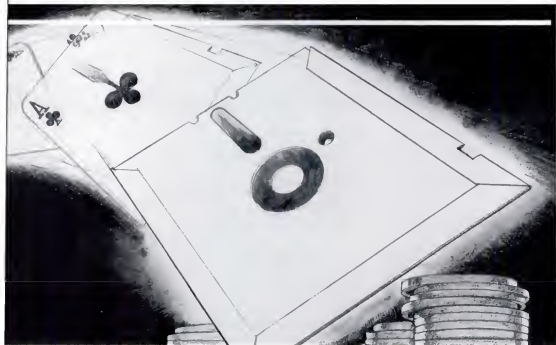
**YOU AND YOUR
agency need to learn
fast and act faster.**

If you want to go it alone and minimize risk, you should have a good advertising agency. What makes an agency good is not necessarily what its people already know

about your field, but their ability to learn your field quickly and apply their creativity and experience to the marketing of your product. In March of this year I knew next to nothing about computer games—minicomputers, medical systems, and multiplexers, yes, but hardly a byte about games. In an industry as new as microcomputers, last year's rookie is this year's coach. You and your agency need to learn fast and act faster. Remember: Nobody in the wild frontier of personal computers inherited the business from daddy.

One Case History

In early 1982, David Handel, M.D., a young father of two, was in the middle of his year of residency in radiology at a big medical center in North Carolina, the Silicon Hills of the Southeast. Handel, who



owned an Atari 800, had been the recent victim of the blackjack tables in Atlantic City. Having seen top blackjack ace Ken Uston beat a Las Vegas casino on CBS's "Sixty Minutes," Handel put 2 and 2 together and saw that it added up to more than 4. "Why not," he wondered, "get Ken Uston to develop a perfect blackjack computer game that would also teach his winning methods?" Nobody could think of a good reason not to, so Handel set to the task immediately.

Hoping to avoid the mail-a-baggie route, Handel created a company, Intelligent Statements, Inc. (Chapel Hill, North Carolina), and engaged the assistance of the advertising agency in which I'm a partner. By March the programmer, whom Handel had hired for a percentage of the royalties, was approaching completion of the program's first version, which was designed to be compatible with Apple II.

Meanwhile, both Handel and the agency were dazzled by the prospect of new markets opened up by the introduction of the IBM PC. They agreed to target the new Ken Uston blackjack game for PC-Land rather than the orchard across the road, especially since blackjack programs to spare were hanging from the apple trees already there.

The programmer obliged this decision by failing to deliver on the Apple version, forcing back all deadlines. It was already April, so despite their postponement, the deadlines loomed. It seemed imperative to publish and publicize the program by

M*UCH* *territory remains uncharted.*

September for the PC+1 Convention, a first for the IBM PC. Appropriately, the gathering was to be held in an Atlantic City casino.

Handel hired a new program designer, who immediately started developing a fresh program specifically for the IBM PC. His company planned to translate it later for the Apple, CP/M, and other systems. The new deadline was July 1.

Under this pressure Handel, a capable program designer in his own right, stepped in to collaborate with Uston on the documentation. Their text instilled it with a comprehensive, sophisticated, generally

grown-up quality. "Grown-up" described the feel of the new product perfectly—thus the new company's slogan, "Grown-up Gameware." The slogan did what slogans should do. It capitalized the characteristics of the company's product line and positioned the company in the marketplace.

Growing Up Fast

As good concepts tend to do, the program grew in complexity as it grew in value. It had to include nearly all the blackjack rules and variations in Nevada and Atlantic City casinos. And because it was the namesake of the world's most prominent blackjack expert, it had to include each of four different card-counting skill levels covered by Ken Uston's computer-optimized teaching system. Then there was the problem of stuffing into 48K of RAM what most programmers would have had a hard time keeping in 64K. The project was a constant challenge and a continuing revelation. More ways to make the program fun to learn and play evolved through the creation process.

All this took time. Simultaneously, the agency had to educate itself and create advertising and other marketing materials. To position the new product in the market-

place, we decided that we needed a two-page, full-color magazine spread rather than the more typical single-page ad used by other game advertisers. The obvious reason for going to two pages—making a big splash—wasn't the only one. We needed the extra coverage just to explain the features of the program.

Getting a photograph of Ken Uston proved to be an interesting task because he is such a difficult man to track down. Uston sleeps odd hours, wears what he pleases, and at any given moment might be writing a book, playing jazz piano, indulging his passion for video games—or doing one or more of these things in one of a thousand places on the globe. We finally rendezvoused with Uston in July in handy proximity to the COMDEX show in Atlantic City. There was barely time to pose him in front of a camera and drop his photo into the face of a playing card in the already composed ad before the magazine deadline arrived. We made it just in time.

By the time August came snapping at our heels, the program was still in development, but now for the Apple as well, since a commitment still existed for the Apple market. Everything else remained in stages of expectant incompleteness. The documentation, literally a book about blackjack, needed touching up. Then there were the operating instructions, which differed for the IBM and the Apple versions. The agency had to coordinate a direct-mail effort to line up merchandisers. It also had to design the program packaging, which we hoped would look and work better than other game packaging. Convention display materials, including ad reprints, a custom-built blackjack table, and corporate image stationery, were all required to conform to fire codes as well as marketing guidelines.

Nobody thought of Intelligent Statements as a one-product company. *Blackjack* was its first product but not its only one. The game had to do more than make a success for itself; it had to provide coattails for a whole line of new games. Intelligent Statements would need new products. We had to inform programmers that we were interested in their software. To help attract game designers and explain procedures and requirements, we developed a brochure for distribution at the convention.

Advertising agencies think of themselves as crisis management concerns. Ordinary jobs turn into rush jobs. This means

they cost more, involve more mistakes, and require more time-consuming administration, often on nights and weekends. In this frenzied atmosphere, one develops an intimate familiarity with many of Murphy's Laws, especially the First Law: "Everything that can go wrong will go wrong."

The primary duty of an advertising agency is to anticipate Murphy's Laws and prevent their worst effects. Fortunately, in this case we met all the deadlines. Nobody suffered permanent damage to the important organs of their bodies. But nobody involved in the entire process was likely to recommend it. If you want to market on the frontier without a guide, you can expect to cross a similar uncharted landscape sooner or later.

ONE OF THE biggest problems in the gameware business is the rate at which opportunity grows.

It's too early to gauge the success of our ad campaign for the IBM version of the blackjack game. The one-page ad for the Apple version has so far shown good results, so we aren't too worried about the game's primary (IBM) market. If we did our job right, Ken Uston's *Professional Blackjack* should be a familiar item on store shelves and in computer trade advertising. What's more, new proposals should be moving through the development process. David Handel, M.D., should be enjoying his new success as an entrepreneur as much as he enjoys his radiology career. And our agency should be at work marketing an assortment of products for his company. As for the rest of the software frontier, it's hard to say. Much territory remains uncharted.

A Guide to the Frontier

One of the biggest problems in the gameware business is the rate at which opportunity grows. This morning's news is tonight's history. Future shock isn't a haz-

ard on the frontier. The present is shocking enough. If your impulse is to run for cover, forget it. But if you're the sporting type, you need to make like a fullback in football—run for daylight.

There's room for everybody and everything, room for better versions of existing products and products nobody has ever seen before.

The possibilities for gameware are as unlimited as the imaginations that explore it. But development of the possibilities may require what amounts to military support from the marketing cavalry of an advertising agency or its equivalent. Not to mention ammunition in dollars that can easily run into 6-digit sums. When you don't know precisely where you're going (and worse, when you don't know what you're doing), things never cost less than you planned. They can cost a lot more. The oldest gambling axiom, "Don't bet more than you can lose," was never more appropriate than here on the frontier.

Get the Help You Need

If you're developing the perfect game to change the world and you want to lay claim to the parts of the world your game will change, it may be advisable to take your game to a software supplier who has the goods to do the job. Find a company that offers generous compensatory agreements and expert assistance in program development.

You may need the assistance. Every business, like every person, tends to take issues and crises personally, to suffer from what advertising people call the "interior point of view." If the business is also a single person, the problem can get very personal, especially when the development of that person's product involves talking for months to a screen through a keyboard. You need a disinterested outsider to help you understand that everything looks bigger and weighs more when it's sitting on your shoulders. Today's crisis is tomorrow's memory. Just as a good ad agency usually knows more about marketing than a software company, a good software company knows more about gameware development than you do.

An important issue for the gameware creator is: Who can you trust? One problem with our industry at this point is that some disputes are being settled in courts. This assures the wealth of lawyers and

limits the willingness of software publishers to promise anything to authors in their literature. Publishers view promises as loopholes through which lawyers can slither, so the smart ones are reluctant to make them. At some point you have to fall

PUBLISHERS view promises as loopholes through which lawyers can slither.

back on your pioneering instincts and trust somebody. This means that you look for the best deal for yourself and try to find an outfit that backs its products with first-class marketing. This doesn't mean you have to give away your share of the pie. A good software company is one that is committed to its authors.

Breaking the Rules

There are a number of rules, from Murphy and other sources, that are worth posting on your wall. One comes from advertising: "Newborn ideas are like newborn babies—they all look cute for about 3 days." Another says, "You don't train your horses during the race." The problem here is that there usually isn't time for training, so you'd better get some very fast-learning horses or hook up with a team that already has a full stable.

That gloomy oracle, Mr. Murphy, maintained that "Anything you try to fix will cost more and take longer than you thought." He also claimed that "Everybody has a scheme for getting rich that will not work." One may find encouragement, however, in the words of advertising creator Ed McCabe. "I don't believe in rules," he says. "The only rule out the possibility of brilliant exceptions." /PC

David Searls is Creative Director of Hodskins, Simone & Searls Advertising in Raleigh, North Carolina. His firm specializes in high-technology marketing.



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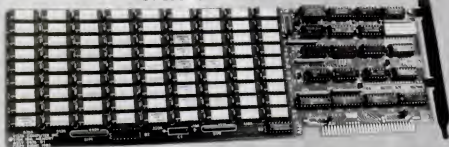
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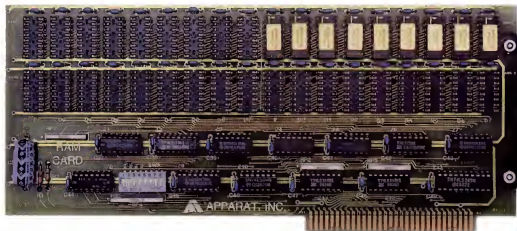


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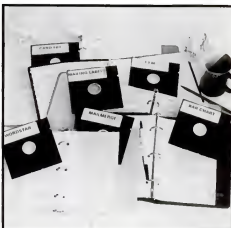
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GAMES

Game connoisseurs rejoice! New games for the PC are pouring into the marketplace. The proof is in the chart accompanying these reviews. It has vital statistics on every PC game we could track down by press time. Testing every computer game listed in the chart was not possible, but those reviewed in detail represent the range of available PC games.

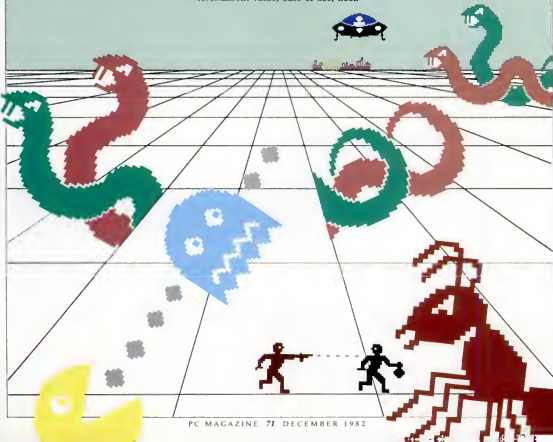
You'll find sophisticated strategy games that require clever detective work and shoot-'em-up arcade games

for players who are quick on the joystick. Students who crave painless ways of learning a subject and blackjack fans hoping to hone their betting skills will find instructional and gambling games. Simulation software allows you to strike it rich on the stock market or win a drag race, depending on your inclination. And if you believe that variety is the spice of life, check out the anthology packages.

Each review offers a candid, independent assessment of a game's entertainment value, ease of use, docu-

mentation, accuracy, error handling, and warranty support. After careful reading, you'll be able to find just the right game to test your skills or seek your vicarious fortune.

The chart provides enough information to point you in the right direction, but when making a purchase, be sure to inquire about additional hardware requirements and details about individual games. And don't forget to check future issues of PC for new game reviews.



GAMES



MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
Acorn Software 634 North Carolina Ave. SE Washington, D.C. 20003	EVEREST EXPLORER	B/W	Strategy	48K, one disk drive \$19.95
	LOST COLONY**	B/W	Strategy	48K, one disk drive \$39.95
Aeon Concepts Computer Products Division 1657 Red Mill Pittsburgh, PA 15241 (412) 831-5352	MICROCOSM**	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter, 40- or 80-column monitor \$39.95
Alcazar Associates 2638 S. Lynn St. Arlington, VA 22202 (703) 684-8053	STELLAR DEFENDER**	Color & B/W	Arcade	32K, one disk drive \$14.95
Alpha Software Corp. 12 New England Executive Park Burlington, MA 01803 (617) 229-2924	QUESTION	B/W	Instructional	64K, one disk drive \$45
Alphanetics P.O. Box 597 Forestville, CA 95436 (707) 887-7237	U.S. MOTORS	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter \$39.95 each
	GAMES PAC I & II	Color & B/W	Arcade	
	ATLANTIC CITY	Color & B/W	Gambling	
	PROSTHESES	Color & B/W	Strategy	
	WORD WHIZ	Color & B/W	Instructional	
	STATES 'N CAPS	Color & B/W	Instructional	
Anthony A. Schultz 310 153rd St. Calumet City, IL 60409	MAN IN THE MOON	B/W	Arcade	48K, one disk drive \$14.95
Armonk Corporation 610 Newport Center Dr. Newport Beach, CA 92660 (714) 760-3955	EXECUTIVE SUITE	B/W	Strategy	64K, one disk drive \$39.95
Avalon Hill Game Company 4517 Harford Rd. Baltimore, MD 21214 (301) 254-5300	MIDWAY CAMPAIGN**	Color & B/W	Arcade	48K, one disk drive \$21
	COMPUTER STOCKS & BONDS**	Color & B/W	Strategy	64K, one disk drive \$25
	VOYAGER GALAXY	Color	Arcade	48K, one disk drive, color/graphics adapter \$25
	COMPUTER DRAW POKER	Color & B/W	Gambling	48K, one disk drive, color/ graphics adapter \$21
	GALAXY**	Color & B/W	Strategy	48K, one disk drive \$25
Bella Software 500 Citizens Bank Center Richardson, TX 75080 (214) 238-5436	BUG-OFF	Color	Arcade	48K, one disk drive, color/graphics adapter \$34.95
Brauer Computer Support P.O. Box 86634 San Diego, CA 92138	METEOR MATH**	Color & B/W Sound	Instructional	64 K, one disk drive, color/graphics adapter \$39.95

MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
Blue Chip Software 19824 Ventura Blvd. #125 Woodland Hills, CA 91364 (213) 881-8288	MILLIONAIRE**	Color & B/W	Simulation	64K, one disk drive, color/graphics adapter, 40- or 80-column monitor \$99.95
C&C Software 54 Sonoma Ave. Goleta, CA 93117 (805) 685-8802	BACKGAMMON	Color & B/W	Strategy	64K, one disk drive, color/ graphics adapter, 40- or 80- column monitor \$29.95
C&C Software, Inc. West Bearden Office Plaza 316 Nancy Lynn Ln. #26-B Knoxville, TN 37919 (615) 584-9774	FOOTBALL PREDICTOR '83**	Color	Statistics	64K, one disk drive, color/graphics adapter \$39.95
	DUNGEON DUAL	Color Sound	Arcade	64K, one disk drive, color/graphics adapter \$34.95
	SPACE PIRATES	Color Sound	Strategy	64K, one disk drive, color/graphics adapter \$34.95
Codex P.O. Box 75 Bedminster, PA 18910	CHAMELEON	Not Available	Strategy	80-column monitor \$19.95
Computer Sports System 22458 Ventura Blvd. Ste. E Woodland Hills, CA 91364 (213) 992-0514	PRO FOOTBALL	Color & B/W	Statistics	64K, one disk drive \$195
Computerenergy Corporation P.O. Box 6267 Denver, CO 80206	FOOTBALL GAME	Color & B/W	Strategy	64K, one disk drive \$15
Computricks, Inc. 533 Fifth St. Santa Rosa, CA 95401 (707) 544-8363	BRIDGE TUTOR**	Color	Instructional	64K, one disk drive, color/graphics adapter \$60
Davell Custom Software P.O. Box 4162 Cleveland, TN 37311 (615) 336-3055	MILKY WAY MERCHANT	B/W	Strategy	48K, one disk drive \$29
	SPELLING VOCABULARY BUILDER	B/W	Instructional	48K, two disk drives \$50
Digital Marketing 3670 Cherry Ln. Walnut Creek, CA 94596 (415) 938-2880 Telex: 17-1852	ASTRO-DODGE	Color & B/W	Arcade	64K, one disk drive, color/graphics adapter, 40- or 80-column monitor \$39.95
Direct. entertainment 695-C S. Broadway Boulder, CO 80303	GROUND-UP**	Color	Arcade	48K, one disk drive, color/graphics adapter \$29.95
DP Computer Services Company 5019 N. Washington Blvd. Arlington, VA 22205 (703) 276-1333	PODLASERIUM**	Color & B/W Sound	Arcade	64K, one disk drive, color/graphics adapter \$34.95

GAMES



MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
Ensign Software 2312 N. Cole Rd. Ste. E Boise, ID 83704 (208) 378-8086	TREASURE HUNT**	Color & B/W	Arcade	64K, one disk drive, color/graphics adapter \$19.95
	CHOMP	Color & B/W	Arcade	64K, one disk drive, 40- or 80- column monitor \$29.95
	ASTRO ATTACKER	Color & B/W	Arcade	64K, one disk drive, color/graphics adapter \$29.95
	FUN 10	Color & B/W	Anthology	48K, one disk drive \$29.95
EPYX 1043 Kiel Cl. Sunnyvale, CA 94086 (408) 754-0700	TEMPLE OF APSHAI**	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter \$39.95
	UPPER REACHES OF APSHAI**	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter \$19.95
Funtastic, Inc. 5-12 Wilde Ave. Drexel Hill, PA 19026 (215) 622-5716	SNACK ATTACK	Color Sound	Arcade	64K, one disk drive, color/ graphics adapter \$38.95
Gross National Products, Inc. 174 Central St. North Reading, MA 01864 (617) 664-3815	CASHMAN	Color & B/W Sound	Arcade	64K, one disk drive \$39.95
IBM Corporation Systems Products Division P.O. Box 1328 Boca Raton, FL 33432 (800) 447-4700 (800) 322-4400 Illinois (800) 447-0890 Alaska, Hawaii	FACT TRACK**	Color	Instructional	64K, one disk drive, color/graphics adapter \$90
	ADVENTURE**	Color & B/W	Strategy	32K, one disk drive, color/graphics adapter \$30
	ARITHMETIC GAMES SETS 1 & 2	Color	Instructional	64K, one disk drive, color/graphics adapter \$60 each
Infocom, Inc. 55 Wheeler St. Cambridge, MA 02138 (617) 492-1031	DEADLINE**	B/W	Strategy	48K, one disk drive
	ZORK I**	B/W	Strategy	\$39.95 each
	ZORK II**	B/W	Strategy	
Info-Pros, Inc. 2102 Business Center Dr. #132 Irvine, CA 92715 (714) 851-8975	GALAXY MASTER**	Color	Arcade	64K, one disk drive \$29.95
Ivy Research, Inc. 88 Yale Station New Haven, CT 06520 (203) 432-3004	SLYNX**	Color & B/W	Arcade	64K, one disk drive \$34.95
	VIPER**	Color & B/W	Arcade	64K, one disk drive \$29.95
	DUNGEONEER	Color & B/W	Strategy	64K, one disk drive \$38.95
	MEDUSA	Color & B/W	Strategy	64K, one disk drive \$34.95

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Kejon E-Ware 5105 Liles Rd. Raleigh, NC 27606	STARCRUISER COMMANDER	Color & B/W Sound	Strategy	64K, one disk drive, color/graphics adapter \$29
	FAMILY GAMES I & II	Color & B/W Sound	Anthology	64K, one disk drive, color/graphics adapter GAME I \$29 , GAME II \$24
	BATREK, GOPPA/ GOP, CHASE	Color & B/W Sound	Arcade	64K, one disk drive, color/graphics adapter, 80- column monitor for color graphics \$34
KK Games 251-D Quinby Rd. Rochester, NY 14623 (716) 424-1676	PROJECTILE	B/W Sound	Strategy	48K, one disk drive \$20
Linear Aesthetic Systems P.O. Box 23 West Cornwall, CT 06796 (203) 672-6360	POLYCUBE**	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter \$26.95
Med Systems Software P.O. Box 358 Chapel Hill, NC 27514 (800) 334-5470 (919) 933-1990	ASYLUM**	B/W	Strategy	48K, one disk drive \$39.95
Intelligent Statements, Inc. The Courtyard #21 P.O. Box 2602 Chapel Hill, NC 27514 (919) 942-0008	KEN USTON'S PROFESSIONAL BLACKJACK**	Color & B/W	Gambling	48K, one disk drive \$89.95
Michael Cordon, DP1 DPSCAPAC PH, Box 9 Pearl Harbor, HI 96860	MAZE**	Color	Arcade	48K, one disk drive Not for sale; program in this issue
Microad Associates, Inc. P.O. Box 1759 Kingston, NY 12401 (914) 338-3360	WHIRLEE**	Color	Arcade	64K, one disk drive, color/graphics adapter \$35
Microbase Software, Inc. P.O. Box 40353 Indianapolis, IN 46240 (317) 877-4304	ARCADE I	B/W	Anthology	64K, one disk drive \$15.95
Micro-G P.O. Box 102 Duluth, GA 30136 (404) 476-5779	PAINTER I & II** PALETTE*, SAUCER**	Color & B/W Sound	Anthology	48K, one disk drive, color/graphics adapter \$29.95
Micro Masters Software P.O. Box 513 Edmonton, Alberta T5J 2K1 Canada (403) 922-3088	MASTER BREAKDOWN	Not available	Arcade	32K, one disk drive \$50 (Canadian)
Micro Productions, Inc. P.O. Box 147 Georgetown, TX 78626 (512) 863-3079	GAMES VOLUME I	Color & B/W Sound	Anthology	64K, one disk drive, color/graphics adapter \$29.95
	GALACTIC ENCOUNTERS	Color & B/W	Arcade	64K, one disk drive, color/graphics adapter \$34.95

GAMES



MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
Microsoft Corporation 10700 Northup Way Bellevue, WA 98004 (206) 828-8080	DECATHLON**	Color Sound	Strategy	64K, one disk drive, color/graphics adapter \$35
	TACHYON	Color	Arcade	64K, one disk drive, color/graphics adapter
	SPYDER	Color	Arcade	\$39.95 each
	HEXTASY	Color	Strategy	
Mirror Images Software 1223 Peoples Ave. Troy, NY 12180 (516) 274-2335	BATTLESHP	Color	Strategy	\$29.95
	HI-ROLLERS	Color	Gambling	48K, one disk drive, color/graphics adapter \$47
	POKER PARLAY	Color	Gambling	48K, one disk drive, color/ graphics adapter \$37
	STICKFIGS	Color	Anthology	48K, one disk drive, color/ graphics adapter \$22
New Ventures Systems P.O. Box 2141 Chesapeake, VA 23320 (804) 482-1889				
N.F. Systems P.O. Box 76363 Atlanta, GA 30358 (404) 252-3302 Source: TCK071	GALAXY TREK**	Color & B/W	Arcade	96K, one disk drive, color/graphics adapter \$29.95
Norell Data Systems 3400 Wilshire Blvd. P.O. Box 70127 Los Angeles, CA 90010 (213) 257-2026	THE ORIGINAL ADVENTURE	Color & B/W	Strategy	64K, one disk drive, color/graphics adapter \$24.95
Norfolk Systems 8 North Folk Rd. Laurel Springs, NJ 08021	WORD-SCORE**	Color	Instructional	64K, one disk drive, color/graphics adapter \$29.95
Omic Corporation 1268 Main St. #207 Newington, CT 06111 (203) 666-4240	SPACE GUARDIAN**	Color & B/W	Strategy	64K, one disk drive \$29.95
	CHAMPION/ DRAUGHTS	Color & B/W	Instructional	64K, one disk drive \$34.95
	BLINGSPLATZ	Color & B/W	Arcade	64K, one disk drive \$34.95
Optimal Computer Solutions, Inc. P.O. Box 585 Bound Brook, NJ 08805 (201) 356-0892	MAZE	Color & B/W Sound	Arcade	48K, one disk drive \$10 each \$30 for all seven games
	BOMBER	Color & B/W Sound	Arcade	
	FOUR	Color & B/W Sound	Strategy	
	PONG	Color & B/W Sound	Arcade	
	SIMON	Color & B/W Sound	Strategy	
	HANGMAN	Color & B/W Sound	Instructional	
Orion Software P.O. Box 2488 Auburn, AL 36830	PC MAN	Color	Arcade	48K, one disk drive, color/graphics adapter \$29.95

MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
PCSoftware 4155 Cleveland Ave. San Diego, CA 92103	CHAMPIONSHIP BLACKJACK**	Color & B/W	Gambling	64K, one disk drive \$34.95
	PCFOOTBALL	B/W	Strategy	64K, one disk drive \$34.95
	CONCENTRATE	Color	Strategy	64K, one disk drive, color/graphics adapter \$34.95
Personal Computer Products 1400 Coleman Ave. #C-18 Santa Clara, CA 95050 (408) 988-0164	OMEGABUC**	Color & B/W Sound	Arcade	64K, one disk drive, color/graphics adapter \$29.95
Quala 1014 Griswold Ave. San Fernando, CA 91340 (213) 365-9526	LAS VEGAS BLACKJACK**	Color & B/W Sound	Gambling	64K, one disk drive \$39.95
SCC Games 9025 Andromeda Dr. Burke, VA 22015 (703) 455-2379	FLIPPINCAME	Color & B/W	Strategy	64K, one disk drive \$19.95
Science Research Associates, Inc. 155 N. Wacker Dr. Chicago, IL 60606 (800) 621-0476 (213) 621-0664	FREE ENTERPRISE	Not available	Strategy	64K, one disk drive (printer, recommended) \$60
Science Research Associates 19402 S. Gumlock Ave. Carson, CA 90746 (213) 979-0569	CROSS CLUES**	Color & B/W Sound	Instructional	64K, one disk drive, color/graphics adapter \$29.95
Sierra On-Line, Inc. 36575 Mudge Ranch Rd. Coarsegold, CA 93614 (209) 683-6858	ULYSSES & THE GOLDEN FLEECE	Color & B/W	Strategy	48K, one disk drive, color/graphics adapter \$39.95
SoftSpot Micro Systems P.O. Box 415 North Canton, CT 06059 (203) 379-7047	AQUA RUN	Color & B/W	Arcade	64K, one disk drive, color/graphics adapter \$39.95
Spinnaker Software 215 1st St. Cambridge, MA 02141 (617) 868-4700	SNOOPER TROOPS SERIES	Color	Instructional	64K, one disk drive, color/graphics adapter \$29.95
	RHYMES AND RIDDLES	Color	Instructional	64K, one disk drive, color/graphics adapter \$29.95
	FACE MAKER	Color Sound	Instructional	64K, one disk drive, color/graphics adapter \$34.95
	STORY MACHINE	Color Sound	Instructional	64K, one disk drive, color/ graphics adapter \$34.95
	CHRISTMAS SAMPLER	Color Sound	Anthology	64K, one disk drive, color/graphics adapter \$29.95



GAMES



MANUFACTURER	PRODUCT NAME	GRAPHICS/SOUND	TYPE OF GAME	REQUIREMENTS, PRICE
Software Laboratories, Inc. 6924 Riverside Dr. Dublin, OH 43107 (800) 531-1309 (614) 889-5083	STOCK MARKET	B/W	Simulation	48K one disk drive \$10 each; \$20 for all three games
	DRAG RACE	B/W	Simulation	
	PLANET	B/W	Simulation	
Strategic Simulations, Inc. 465 Fairchild Dr. #108 Mountain View, CA 94043 (415) 964-1353	THE WARP FACTOR	Color & B/W	Strategy	48K, one disk drive Price not available
Starware 2000 K St. NW Washington, DC 20006 (202) 466-7351	MATH DRILL I	Color & B/W	Instructional	64K, one disk drive \$25
Stoneware Inc. 50 Belvedere St. San Rafael, CA 94901 (415) 454-6500	COMPUCUBE	Color	Instructional	48K. Price not available
SuperSoft, Inc. P.O. Box 1628 Champaign, IL 61820 (217) 359-2691 Telex: 270-365	NEMESIS	Not available	Strategy	64K, one disk drive \$45
	DUNGEON MASTER	Not Available	Strategy	64K, one disk drive \$40
Survey Systems, Inc. 7507 Princeton Ave. College Park, MD 20704	CASINO BLACKJACK	Color & B/W	Instructional	64K, one disk drive, color/graphics adapter \$24.95
TexasSoft 1028 N. Madison Ave. Dallas, TX 75208 (214) 495-5052	TRILOGY	B/W	Strategy	64K, one disk drive, BASICA \$35
	SET THE HOSTAGES FREE	Color & B/W	Arcade	64K, one disk drive \$35
	QUEEN OF HEARTS	Color & B/W	Arcade	64K, one disk drive \$35
	SQUIRM	Color & B/W	Arcade	64K, one disk drive \$35
United Systems Corporation 1074 E. Sandpiper Dr. Tempe, AZ 85283	TUNNEL ATTACK	Color Sound	Arcade	64K, one disk drive, color/graphics adapter \$39.95 each
	ULTRA LIGHT COMMAND	Color Sound	Arcade	
Westwood Software 1670 N.W. Emperor Dr. Dept. PC11 Corvallis, OR 97330 (503) 745-5500	MICRO-FOOTBALL	Color	Strategy	64K, one disk drive, color/graphics adapter Price not available
Windmill Software, Inc. 1058 Joan Dr. Burlington, Ontario L7T 3H2 Canada (416) 632-6279	VIDEOTREK 88	Color & B/W Sound	Simulation	64K, one disk drive, color/graphics adapter \$34.95 each
	FLOPPY FRENZY	Color Sound	Arcade	
Word Associates 55 Sutter St. #361 San Francisco, CA 94104 (800) 227-3800 ext. 1138 (800) 792-0990 ext. 1138 California	JOTTO	Color & B/W	Instructional	64K, one disk drive, 40- or 80-column monitor \$29.95

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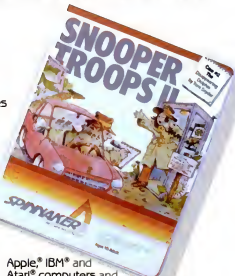
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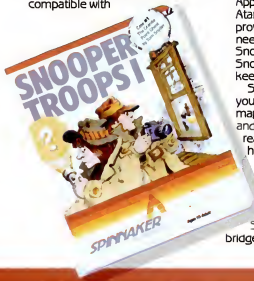


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Software, 215 First Street, Cambridge, MA 02142.



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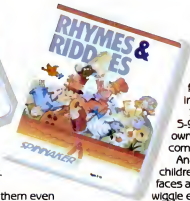
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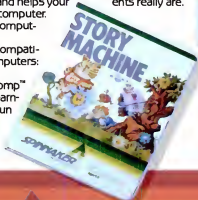
Rhymes and Riddles™ (Ages 4-9) is a letter guessing game featuring kids' favorite riddles, famous sayings and nursery rhymes.

Story Machine™ (Ages 5-9) lets children write their own stories and see them come to life on the screen.

And FACEMAKER™ lets your children create their own funny faces and make them wink, smile, wiggle ears (not your kids' ears, the ears on the screen), etc.

And we're introducing new games all the time.

So look for Spinnaker games at your local software retailer, or by writing to: Spinnaker Software, 215 First St., Cambridge, MA 02142. And show your kids how smart their parents really are.



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Adventure Is The Game

Here's your chance to be a starship captain, Charles Darwin, or a maze-bound mouse.

MICROCOSM

Aeon Concepts
1657 Red Mill
P.O. Box 12595
Pittsburgh, PA 15241
(412) 831-5352

List Price: \$39.95

Requires: 64K, one disk drive

Age-group: 12 to adult

Number of Players: One or two

What VisiCalc did for spreadsheets, Microcosm does for the game of Life. But Microcosm revolves around the concepts of evolution and natural selection.

At last the ultimate use for the IBM happy face character has been found. When playing alone, the player starts by placing smiling faces on the playing grid (adjacent rows of dots). Once satisfied with the population distribution, the player hits the Esc key and waits to see which smiling faces make it to the next generation, based on the predetermined Laws of Survival. With each generation comes a realistic depiction of the growth and demise of the masses; faces come and faces go. But this is where the 10-year-old game of Life stops and Microcosm takes off.

Many computer games lack the variations that give Microcosm its depth and make it interesting enough to play repeatedly. Microcosm allows players to increase their populations or to create visually pleasing patterns. Two players can create conflicting populations of faces on the same grid, or they can compete independently on separate grids. It is refreshing to escape from the "you lose, I win" concept of so many games. Other options allow the user to plug in to 50 standard

colony patterns and watch them change through the years. A Mutation feature completely overhauls the Laws of Survival, altering the familiar patterns of colony migration. A microbe virus can even be injected into either player's population and its effects observed.

Ease of Use

Microcosm is well thought out and has

been thoroughly tested. The user can play with the sound on or off and can alter almost every feature of the game. The only possible improvement would be the ability to display the succeeding generations more quickly, but even this would not diminish the anxiety in competitive play.

Documentation and Use of Graphics

Microcosm comes with a complete tutorial program and a manual that fully explains all variations of the game and its special function keys. There is even a troubleshooting guide in case the disk does not work. Once the user has transferred DOS and BASICA with Microcosm to a playing disk, the 35-page manual is no longer needed. The game also does a good job with the PC's monochrome graphics; the progress of each "culture" is clear and easy to follow.

General Appeal

This is definitely not a shoot-em-up game. Microcosm is as enjoyable for those who have never played Life as it is for veteran players who are looking for a mantle piece edition.



Figure 1: Maze program listing

You are about to play a game of maze. To win a round, you must have the best time (least!). Maze numbers are from 0 (zero) to 32000. Difficulty is 1-10 with 5 being assumed.

Difficulty? (1-10) [5]
? 7

If you pick 8,9, or 10 the maze might not have a solution. Hit the space bar to make a new one. But the clock runs on, so think quickly!

Enter the maze sequence number 1-32000 or return to use: [1]
? 1
Break in 230
Ok

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Accuracy and Error Handling

Microcosm is a professional product. The program meticulously follows the Laws of Evolution described in the documentation. It also makes good use of the function keys. The F1 key displays the



THE GAME rejects erroneous keystrokes with a sad little tune.

functions of the other function keys. The game rejects erroneous keystrokes with a sad little tune.

Aeon Concepts disclaims all responsibility for the software. It does, however, guarantee the disk for 90 days after purchase.

GALAXY TREK

N.F. Systems
P.O. Box 76363
Atlanta, GA 30358
(404) 252-3302

List Price: \$29.95

Requires: 96K, 80-column display,
one disk drive

Age-group: 9 to adult
Number of Players: One

Golaxy Trek is a new version of the popular Stor Trek game. In this game there is no Mister Spock to solve the problems, and the starship is called the Columbia. Once signed on as starship captain, the player is given a mission with the whole

galaxy at his or her disposal.

There are 64 sectors of space in which to travel, some of them known and others awaiting the Columbia's arrival to reveal their splendor or megaton-armored enemies. The player normally sees only his or her own sector of space represented by a few stars, an (S) for the starship, and +M+ for the invaders. The only movement occurs when one jumps to different coordinates; otherwise it's very much like a chess game.

ONCE SIGNED
on as starship captain,
the player is given a
mission with the
whole galaxy at his or
her disposal.

The player travels from star base to star base to keep torpedoes and force shields replenished; then the Columbia sallies forth again in search of the unknown megaton invaders. It's the captain's duty to set navigation coordinates and warp speed, and even to talk to the computer in standard Stor Trek tradition.

Full documentation is provided in a hard-cover folder. The game requires 96K

of memory, which is more than many players have.

General Appeal

Galaxy Trek is fun to play, just as *Star Trek* has always been. It is, however, too close to the game of *Star Trek* to make the player feel like captain of anything but the Enterprise. It is visually like a board game, although it uses some flashy graphics when the Columbia is destroyed. IBM BASIC offers even the novice programmer numerous screen drawing commands.

Minimal color and none of the function keys are used, but some sound effects are provided. *Galaxy Trek* appears to be a generalized BASIC version of *Star Trek*, perhaps written for another computer and translated for use with the PC.

The player is asked to guess a number at the beginning of the game. If the player responds with a large number, the program stops dead. If he or she issues an incorrect command, a "Redo from start" error message appears. These bugs are minor, especially when compared to those of

the home versions of *Star Trek* that bomb out every 3 minutes or so from searching for long-forgotten line numbers and RETURNS without GOSUBS, and the manufacturer says they are being corrected.

Defective disks will be replaced free of charge by the manufacturer, with no time

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Ziatech also manufactures GPIB interfaces for MULTIBUS† and STD bus



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(805) 541-0488

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limit from date of purchase.

For those who want a debugged version of *Star Trek* without the familiar voices of Mister Spock and Scotty, *Galaxy Trek* is an excellent choice. This game is not for an experienced Captain Kirk seeking a vastly improved Enterprise command, but those who have never played *Star Trek* and have never relished the feeling of arriving on the battle screen with shields on full and phasers locked on target should go out and buy a copy today.

MAZE

Michael Gordon DP1

DPSPAC PH Box 9

Pearl Harbor, HI 96860

List Price: Not for sale, program included (see Figure 1)

Requires: 48K, one disk drive

Age-group: 8 to adult

Number of Players: One

Maze is exactly what the name implies—a game that fills the display with a randomly generated maze and challenges the player to race from one side of the screen to the other before time runs out. Agile use of the arrow keys maneuvers the player from one twisting corridor to the next, leaving behind a colored trail. This trail comes in handy when the player inadvertently winds up in a cul-de-sac with nowhere to go but back.

Only one player is allowed to compete

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16K, One Drive, PC-DOS \$29.95

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Atlantic City

Key at the mills of gambling at Atlantic City without any of the suspense risks. Walk right up to a slot machine, play some, then move up to the Wheel of Fortune, or the Roulette, Craps, or Blackjack Tables. All gambling a main drive and asks full use of realistic casino sounds. Version 1 utilizes high-res graphics (for IBM's with 300 graphics board only), while version 2 is for monochrome displays.

version 1 - Requires color board.
version 2 - Works with any 3M-PC

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DICE Turn your \$5000.00 computer into a pair of dice
NUMBER GUESS Outsmart your dumb computer
SCRAMATRIX Scrambles your brains as well as eggs
TIC-TAC-TOE If you against the computer
HAMURABI Rule your ancient kingdom wisely but watch out for those revolting peasants!

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at a time. The complexity of the mazes is determined by the difficulty level chosen from a scale of 1 to 10. In each game the player is asked for a random number seed to vary each succeeding series of mazes. Levels 9 and 10 are mazes with no possible solutions; the only option is to hit the space bar to create a new maze that may have a way out. The clock keeps ticking throughout the whole process.

General Appeal

Moze is very easy to play and requires minimal explanation. The five-page documentation describes the game wittily and includes a BASIC listing for the complete three-page program.

The mazes are well drawn, and the movement around the pathways is fast and easy. For games with a great deal of variety or depth, there are better choices than Moze. The game is fun to play initially, but interest may wane, after one has played it for a while.

Moze, on the other hand, offers three pages of straightforward BASIC code that would be a good tutorial for those experimenting with programming. The player can vary the size, shape, and complexity of the mazes or make enhancements with a judicious use of the BASIC manual and imagination.

THE MAZES
are well drawn, and
the movement around
the pathways is fast
and easy.

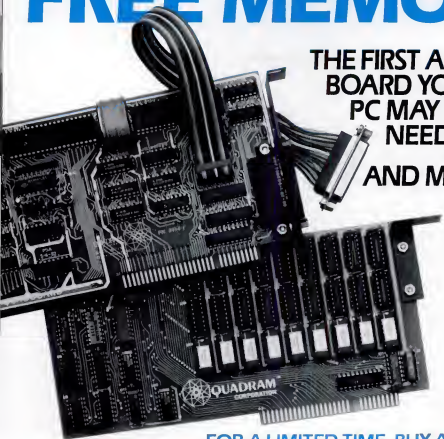
Moze should be considered as a simple program that performs its one function adequately. It is not a professional-quality, fully protected program by any means. Although Moze lacks variety, it is good for people who want to understand BASIC by taking apart a pretested game and changing it to their own specifications.

/PC

Greg Estes is a programmer/analyst for Professional Software in Eugene, Oregon.

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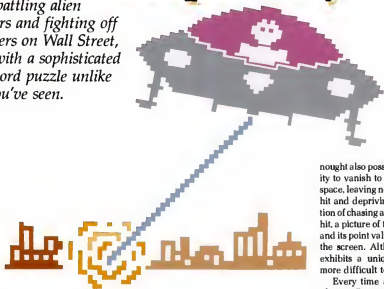
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STELLAR DEFENDER

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(703) 684-8053

List Price: \$14.95

Requires: 32K, 80-column display, one disk drive

Age-group: 8 to adult

Number of Players: One (but fun for groups)

Stellar Defender is a straightforward arcade-style game that tests a player's skill against the computer's. The player commands a fleet of five spaceships called Stellar Rangers by moving an arrow cursor left or right with keys 4 and 6 on the keypad. The game begins when one of the Rangers appears at the bottom of the screen; at the top of the screen, waves of alien ships appear, blinking as they change position. As they descend to the bottom of the screen, the aliens drop deadly projectiles. If a Stellar Ranger is located directly below an alien when it discharges

its lethal cargo, the Ranger is annihilated. There is no escape from this situation.

The object of the game is to shoot the aliens out of the galactic sky. To do this a player moves the cursor upward. A successful hit eliminates an alien ship in a flash of light. But the aliens come in waves of five ships, and they are intent upon one thing—overwhelming a player's defenses. If one alien ship is successful, all five return to the top of the screen to prepare for another battle. However, if several are close to the bottom of the screen, a player can make an interesting sacrifice. Allow one Stellar Ranger to be hit, and only the aliens remaining on the screen return to the top.

Four types of ships comprise an alien squadron: Scouts, worth 10 points; Draconians, 25; Cruisers, 50; and Dreadnoughts, 150. A different graphic symbol is used for each one. A player's ships resemble small tear drops. Scouts, Draconians, and Cruisers can be blasted into oblivion with a single shot, but a Dreadnought is less vulnerable and requires no fewer than two hits to be destroyed. A Dread-

nought also possesses the maddening ability to vanish to a new location in hyperspace, leaving no evidence that it has been hit and depriving players of the satisfaction of chasing an injured alien. After each hit, a picture of the next attacker, its name, and its point value appear in the middle of the screen. Although each type of alien exhibits a unique motion, none is any more difficult to hit than another.

Every time a Stellar Ranger is hit, a player's fleet count is reduced by one. To help keep track of losses, the current count appears on the right of the screen. Reinforcements arrive individually after the player successfully fends off a squadron of aliens. The game ends after the player loses all five Stellar Rangers or destroys all the aliens, a theoretical possibility at best for beginning players.

Ease of Use

Stellar Defender requires that players position the first, second, and third fingers of one hand on the left, upper, and right cursor keys. Most players (except perhaps pianists) will have trouble keeping the third finger from slipping onto key 9. Also, it would have made more sense to designate the space bar as the firing button, given its position on the keypad.

Documentation

Stellar Defender is written in BASIC and arrived on an unformatted disk without a write-protect tab. A half-page of instructions describes how to add DOS and how to copy the game to a formatted disk. Documentation consists of a single

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sheet of paper outlining the game, strategy, control keys, and key variables. Regardless of how a player chooses to approach the game, playing instructions are clear and adequate. Instructions outlining monitor and memory requirements are not included in the documentation. They are provided by separate notes in an advertising flyer in which the manufacturer recommends a monochrome display. If play-

place defective disks. The game is priced low enough to compensate for its deficiencies, all of which are minor. Most users would probably play for 30 to 40 minutes.

STOCKS AND BONDS

Avalon Hill Game Company
4517 Hartford Rd.
Baltimore, MD 21214
(800) 638-9292
List Price: \$25

Requires: 64K, one disk drive
Age-group: 14 to adult
Number of Players: One to six

Stocks and Bonds is the computer version of Avalon Hill's board game of the same name. Each of up to six players maintains a portfolio and tries to make as much money as possible from buying and selling in the stock market. The object of the game is to be the wealthiest investor after ten trading periods, each of which represents one year.

Players start with \$5,000. Each trading period begins with a general description

of the market, which is either going up (Bull) or down (Bear). A description of special circumstances that have affected one or more individual stocks follows.

The monitor displays the Price Change Board, which shows the old price, net change, and new price of ten corporations. It also displays stock splits and bankruptcies. When players have thoroughly examined the Price Change Board, each in turn has the opportunity to buy and sell. After the first turn, total worth determines order of play with the wealthiest player going first.

Players view their current portfolios at the beginning of their turns. The monitor displays each stock with its current price, the number of shares owned, dividends (if any), and the total value of the player's holding in each corporation. A short menu allows the player to buy or sell stock, read a short description of a particular company, and review the price history of a security. Just as in the real stock market, it's not clear from the history of a commodity what its future performance will be.

STELLAR

Defender provides a good introduction to computer games.

ers use a TV as a monitor, they should be sure to set the width to 80, since this is what the programmer apparently intends.

General Appeal

Even if a player accepts the limitations of BASIC and a monochrome display, the graphics are reasonably good. The game incorporates sound without making it obtrusive. Still, it would be nice to have the option of turning the sound off, especially at night.

Stellar Defender provides a good introduction to computer games. It would also go well at parties because it is competitive, easy to learn, and doesn't take long to play. It appears to have no problem keeping score accurately. Throughout the game full concentration is required. Left and right movement of a player's ship is painfully slow, which contrasts with the rapid fall of bombs and rise of projectiles. After firing once, a player must move the ship left or right before firing another shot.

Error handling needs improvement. Holding the left/right cursor keys down allows sequential movement of any ship. However, holding down the firing button freezes the game and may result in a fatal mistake: "Illegal Function Call 390." Players who commit this grievous error must start the game over.

Players can copy Stellar Defender for backup purposes. This may obviate the need for additional warranty protection. The manufacturer, however, agrees to re-

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Ease of Use

Three pages of instructions are available at the beginning of the game. They are clear and complete and may be recalled during any player's turn. With these and the various prompts that occur during play, no one should have trouble playing this game.

As is typical with Avalon Hill's products, the letter-size box is attractive and eye catching. The three-page rule booklet gives a good description of the game along with load instructions for the PC. The booklet also provides a short blurb about each stock.

The graphics are not remarkable. Standard-size text characters appear as black on yellow. The Bull and Bear announcements appear in bold, blue characters, but are not well formed. Each type of market is accompanied by its own tune, "We're In the Money," for Bulls and Chopin's "Funeral March" for Bears.

General Appeal

Players who like money games or who

are interested in the stock market will enjoy Stocks and Bonds. It does a good job of presenting the basic ups and downs of Wall Street. The game is rather slow moving, however, which detracts from its general appeal.

Stocks and Bonds is meticulous in its record keeping and price calculations. It does not accept invalid responses, but this can be annoying. For example, when buying or selling a stock, players must enter the first two letters of that stock's name. The first character must be capitalized, while the second character must not. Any deviation from this overly punctilious requirement constitutes an invalid response.

Avalon Hill will replace defective disks free up to 90 days after purchase. After this time, there is a service charge of \$5 for replacements.

The transition from board game to computer game is fraught with peril. The computer version must rely on visual and audio effects to compensate for tactile pleasures like the rustle of paper money and the roll of dice. It must move fast

enough to occupy players between turns, but not so fast as to confuse them. Stocks and Bonds hasn't quite made the transition; it's an enjoyable enough game but probably lacks long-term appeal.

CROSS CLUES

Science Research Associates

19402 S. Gunlock Ave.

Carson, CA 90746

(213) 979-0569

List Price: \$30

Requires: 64K, one disk drive

Age-group: 9 to adult

Number of Players: Two

Cross Clues is a cousin to the crossword puzzle. The PC monitor displays the puzzle, seven squares by seven, on the left side of the screen. Two players compete by guessing words and letters. Their scores appear to the right of the puzzle.

The program comes with 50 stored puzzles. The computer rapidly draws in the grid in bold, blue lines and places a single starter vowel somewhere within the puzzle. Players begin by using arrow cursors to indicate the row or column in the puzzle where they wish to begin play. With no clues except word length and possibly the single vowel (if a player chooses to begin at

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P LAYERS get points when they complete a correct word.

the site of the vowel], the first player guesses a word.

There's only a remote chance that the word is correct, but there is a reasonable chance that it contains one or more correctly placed letters. When this happens, the incorrect letters disappear and the correct one(s) remains in place. If it is a consonant, it transfers from a box below the puzzle (containing all 21 consonants) to every square in which it occurs in the puzzle. The player receives a point for every consonant distributed and gets another guess. Then there are more clues for both players. Players also get points when they complete a correct word.

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Ease of Use

Players preset time limits (from 1 to 5 minutes) according to their skill levels. One might allow a child more time than an adult. A shrinking bar ticking away below the score indicates the time remaining for each turn. The game finishes when a player receives a score of 21 points.

Play is simple with friendly prompts. The only moderately difficult part is positioning the two cursor arrows to point to the first letter of the word. A colored cursor that moves over the whole puzzle would be preferable.

The disk comes in a glossy folder with a brief description. Detailed instructions explain how to transfer the operating system and load the game. No playing instructions are provided and none are needed. After some entertaining introductory graphics depicting Sherlock Holmes's hat, Cross Clues asks the players whether they need instructions. A "yes" is followed by a 5-minute tutorial in which the computer teaches the game. At each step the player becomes more involved until he or she is comfortably competing against the computer. This is some of the most effective

documentation available for any game program.

Cross Clues's graphics are good, with broad lines and large characters. Even with an old color TV the program presents sharp images and is pleasant to watch. Players have the option of turning off the sound, but this shouldn't be necessary as the audio effects are not bothersome. When a player makes a successful guess, the monitor offers congratulations accompanied by cheerful notes.

General Appeal

Cross Clues will appeal to every member of the family. It has a useful "Pause" feature that allows players to rest. If the game is allowed to sit for a while, it reverts to an engaging demonstration mode that asks, "Would you like to learn to play?" It also asks players their names and once these are keyed in, greets them personally.

The spelling is accurate and the score-keeping is flawless. This is a highly professional program. It does not allow erroneous

CCROSS CLUES
is worth adding to any
game library.

ous entries; it even ignores incorrect key presses. To reduce the possibility of errors, the program disables control keys.

There is an elaborate license agreement in the Cross Clues package. The manufacturer, SRA, is a subsidiary of IBM. It will replace a defective disk free of charge within 90 days and for a prorated fee thereafter. The 50 puzzles last a long time, but it would be nice if one could add custom-made puzzles after playing all the preprogrammed ones.

Interestingly, Cross Clues is subtitled "Set 1," suggesting that more is to come. This is one of the best games on the market. Not just another ho-hum program with standard text characters, Cross Clues is worth adding to any game library. /PC

An avid game player, Martin Oakes works for a Fortune 500 company as an engineer and programmer. He uses the IBM PC to calculate weekly and monthly production budgets, to forecast equipment requirements, and to determine manufacturing capabilities.

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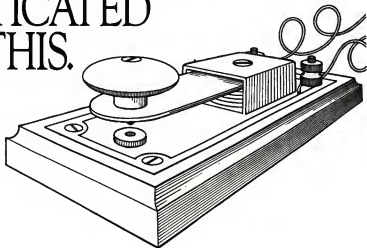
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ZORK I

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List Price: \$39.95
Requires: 48K, one disk drive
Age-group: 14 to adult
Number of Players: One

Zork is a clever, complex program recommended for teenagers or adults, though some children may outperform older Zork I players.

Zork I pits the individual against the terrors of "The Great Underground Empire." Although Zork I is usually played by one person, sideline players often become involved, offering useful advice.

Zork I is basically a treasure hunt. The player must thoroughly explore a vast underground world, eons old and inhabited by mysterious forces, to locate the treasures and secure them in a safe place. Various objects, including deadly weapons, must also be located by the player to aid in the quest. Becoming a Zork master is no easy task: Zork I requires real brain power to overcome obstacles and gather all 20 treasures.

Ease of Use

The Zork I program gives descriptions of places and things and asks for instructions. The player types in directions and suggests answers. There's no clock to race,

so the player can thoroughly consider each move. The interaction between user and computer is more personal than in video arcade-type games that leave the player with damp armpits and bleeding hands. Zork I is a combination of Lord of the Rings and a grand master chess tournament—lots of action, mystery, adventure, and a constant intellectual challenge.

Zork I is fun to come back to again and again. The best strategy is to play until

**THE PLACES
and creatures in Zork I
are right out of your
dreams and
nightmares.**

completely baffled, and then retire for a few minutes, hours, or days. This strategy allows fresh ideas and solutions to germinate.

A player who is unable to solve certain problems may want to buy Invisicues, produced by the Zork Users Group. Invisicues is a booklet of questions about getting somewhere or overcoming obstacles while

exploring Zork land. The answers are written in invisible ink and are made to appear by being rubbed with a special felt-tip pen. (The pen is included with the booklet.) The idea is to give only as much help as is needed. Each answer is more revealing than the previous one. The complete answer is given last.

Invisicues is almost as much fun as Zork, but a player should refrain from reaching for an invisicue until help is desperately needed—the fun in Zork lies in using one's own powers of logic and reason to solve problems. Invisicues is sold at computer stores or can be ordered by sending \$9.95 plus \$2 postage and handling to Zork Users Group, Dept. 20, P.O. Box 20923, Milwaukee, WI 53220-0923 (Wisconsin residents add 5 percent sales tax).

Software and documentation for Zork I are sold in a sealed packet that contains an instruction booklet, disk, IBM PC Interlogic Reference card, and warranty card. Read the Zork I manual before playing. It is short and easy to understand and includes instructions for using the programs that are not revealed during play. The instructions include numerous examples, suggestions, troubleshooting tips, and a list of commands and abbreviations. The game is a genuine challenge and is played exactly as explained in the manual.



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Use of Graphics

The pictures inside the player's head are what's important in Zork I. The designers have wisely refrained from including any graphics, leaving each player free to imagine horrible adversaries and appealing rewards.

The program responds as it should, but not always the way one would prefer. Zork I has the advantage of allowing multiple commands per turn to be entered with periods or the word then between individual instructions.

Error Handling

Whenever Zork I doesn't understand or can't use an instruction in a specific context, it lets the player know in a variety of ways. The instruction booklet lists many of these responses, but not for bizarre commands such as "Walk through the wall" or "Eat the door." Sometimes a weird command will produce an unexpected, helpful result. If not, Zork I's reply is usually good for a laugh.

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The warranty is very limited. The disk is the only item covered, and replacement is guaranteed to only the original owner and disk, only if the warranty card was sent in, only after Infocom, Inc. determines the disk was not tampered with or misused, and only for 90 days from the date of purchase. Program errors are not covered. The warranty states, "The entire risk as to the quality and performance of the computer software program is assumed by the user."

General Appeal

Zork I is appealing on many levels. It is imaginative—the places and creatures in Zork I are right out of your favorite dreams or worst nightmares. It is addicting—Zork I grabs your attention and runs away with it. And it is challenging—tougher than the New York Times crossword puzzle and more baffling than Rubik's Cube.

Perhaps Zork's greatest appeal is the excitement of exploring the unknown and the thrill of discovery, particularly for people who grew up reading science fiction, fantasy, and adventure stories.

As one of the new genre of "Sword and Sorcery" computer games, Zork I is a must for anyone's software collection. It is sur-

prising, impressive, and entertaining. If you divide the purchase price by the number of hours spent enjoying it, it is also a great value.

LOST COLONY

Acorn Software Products
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Age-group: 16 to adult

Number of Players: One

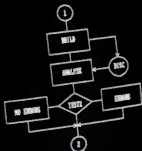
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PLAYING IN
*constant fear of failure
and with no tangible
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The premise is exciting: The player is a member of a colonizing expedition on Warren's World, a distant planet. War has broken out on earth, and 1,700 colonists are completely cut off from help. One person has been elected the sole decision maker, with wide-ranging economic powers. That person alone must decide who will work in what industry, how much each will be paid, how much and where exploration will take place, how scarce resources will be allocated, and what the tax rate will be.



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Along with all this power goes responsibility. Poor decisions will cause unemployment, strikes, and starvation. One poor decision is often all it takes to get the "manager" (player) kicked out of office and onto a farm to work the fields. And in *Lost Colony* poor decisions are very difficult to avoid.

Ease of Use

Play begins with a chart of figures for population, the number of unemployed, consumer goods, cash, living standards, and the number of areas colonized. Below the chart is a list showing the page numbers for the regional summary and status reports on agriculture, mining, energy, manufacturing, and transportation, each accessible on the IBM PC by function keys 1 through 6 respectively. Pressing F3, for example, calls up the mining report, which shows a chart listing the amount of labor, number of robots, living standard, production sites, production, and stock available.

The manager's first job is to decide how

much labor to distribute to each of the five industries. Next comes a decision on distributing robots. Further decisions include how many consumer goods, robots, manufacturing plants, and transports to build, limited by the amount of raw materials on hand. Finally the manager passes out con-

caused a high rate of depreciation.

The key to being a successful manager involves keeping a running count on a large number of interrelated factors. It is imperative to know what these factors mean, what affects them, and what they, in turn, affect. Adjustments in one area mean depletions in another or in several others.

Lost Colony is a game of numbers and statistics. A player who attempts to play the game without thoroughly examining the instruction manual will have absolutely no idea what to do.

After mastering the basics, a player may want to progress to a higher plateau. *Lost Colony* has ten skill levels. On level 10 a novice player will be kicked out of office almost before the first year commences.

Use of Graphics

The manager in *Lost Colony* keeps track of people, robots, and resources through charts. Appealing cartoons of people or things do not appear on the screen; only the numbers and symbols that represent the statistical categories are displayed. *Lost Colony* makes good use of the PC's graphics symbols to make maps and tables readable.

Documentation

In an apparent attempt to streamline the instruction booklet, the author has made it less complete than this complex program merits. Too much effort is wasted in trying to understand what is going on in the game. A player cannot intelligently determine how many of which item to produce without consulting a chart that shows what is required to produce certain goods. It would be helpful if such a chart were included in the booklet or if a player had direct access to a chart page in the program.

Although the manual is stuffed with information, vital facts are buried in long paragraphs of seemingly trivial text. Outlines would have been more useful than narrative explanations. The manual should be clear and concise, because a player must constantly refer to the instructions during the game.

Error Handling

Lost Colony does not become confused when a player enters unusual responses to the prompts. The use of the arrow keys to move the cursor around and excessively

LOST COLONY *is not another kiddie game.*

sumer goods; stockpiles supplies; sets the tax rate; and explores and settles new territories. One round is then completed and the year-end report is displayed. The cycle repeats itself for each successive year, assuming that the manager has not run out of resources or cash, misallocated labor or robots, been faced with a poor harvest, overtaxed the captains of industry, or

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	1	2	3	4	5	6
	Report	Flight	Forecast			
	Jan	Feb	Mar	Apr	May	Jun
Spots	3000					
Cost	1.00					
Flight Length	1:00					

SPOT Report number of spots for starting of 01/01/2022

SPOT is referenced as well as group of spots

SPOT Date

Maximum SPOT

	Region = South Province			
	Jan	Feb	Mar	Apr
Region 1 Sales	2500	2100	2000	2000
Region 1 Cost	1400	1400	1010	1000
Region 1 Gross Profit	1100	700	990	1000

[illegible][illegible]

		The Company's Sales Revenue			
		Jan.	Feb.	Mar.	Apr.
Region 1 Sales		\$2,400,000	\$2,500,000	\$2,600,000	\$2,600,000
Region 2 Sales		\$2,500,000	\$2,400,000	\$2,500,000	\$2,400,000
Region 3 Sales		\$2,600,000	\$2,500,000	\$2,400,000	\$2,500,000
Region 4 Sales		\$2,500,000	\$2,600,000	\$2,500,000	\$2,400,000
Total Company Sales		\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG	HH	HI	HJ	HK	HL	HM	HN	HO	HP	HQ	HR	HS	HT	HU	HV	HW	HX	HY	HZ	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	IM	IN	IO	IP	IQ	IR	IS	IT	IU	IV	IW	IX	IY	IZ	JA	JB	JC	JD	JE	JF	JG	JH	JI	IJ	JK	KL	KM	KN	KO	KP	KQ	KR	KS	KT	KU	KV	KW	KX	KY	KZ	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	LS	LT	LU	LV	LW	LX	LY	LZ	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	MP	MQ	MR	MS	MT	MU	MV	MW	MX	MY	MZ	NA	NB	NC	ND	NE	NF	NG	NH	NI	NJ	NK	NL	NM	NN	NO	NP	NQ	NR	NS	NT	NU	NV	NW	NX	NY	NZ	OA	OB	OC	OD	OE	OF	OG	OH	OI	OJ	OK	OL	OM	ON	OO	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PP	PQ	PR	PS	PT	PU	PV	PW	PX	PY	PZ	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST	SU	SV	SW	SX	SY	SZ	TA	TB	TC	TD	TE	TF	TG	TH	TI	TJ	TK	TL	TM	TN	TO	TP	TQ	TR	TS	TT	TU	th	tv	<th>TW</th> <th>TX</th> <th>TY</th> <th>TZ</th> <th>UA</th> <th>UB</th> <th>UC</th> <th>UD</th> <th>UE</th> <th>UF</th> <th>UG</th> <th>UH</th> <th>UI</th> <th>UJ</th> <th>UK</th> <th>UL</th> <th>UM</th> <th>UN</th> <th>UO</th> <th>UP</th> <th>UQ</th> <th>UR</th> <th>US</th> <th>UT</th> <th>UU</th> <th>UV</th> <th>UW</th> <th>UX</th> <th>UY</th> <th>UZ</th> <th>VA</th> <th>VB</th> <th>VC</th> <th>VD</th> <th>VE</th> <th>VF</th> <th>VG</th> <th>VH</th> <th>VI</th> <th>VJ</th> <th>VK</th> <th>VL</th> <th>VM</th> <th>VN</th> <th>VO</th> <th>VP</th> <th>VQ</th> <th>VR</th> <th>VS</th> <th>VT</th> <th>VU</th> <th>VV</th> <th>VW</th> <th>VX</th> <th>VY</th> <th>VZ</th> <th>WA</th> <th>WB</th> <th>WC</th> <th>WD</th> <th>WE</th> <th>WF</th> <th>WG</th> <th>WH</th> <th>WI</th> <th>WJ</th> <th>WK</th> <th>WL</th> <th>WM</th> <th>WN</th> <th>WO</th> <th>WP</th> <th>WQ</th> <th>WR</th> <th>WS</th> <th>WT</th> <th>WU</th> <th>WV</th> <th>WW</th> <th>WX</th> <th>WY</th> <th>WZ</th> <th>XA</th> <th>XB</th> <th>XC</th> <th>XD</th> <th>XE</th> <th>XF</th> <th>XG</th> <th>XH</th> <th>XI</th> <th>XJ</th> <th>XK</th> <th>XL</th> <th>XM</th> <th>XN</th> <th>XO</th> <th>XP</th> <th>XQ</th> <th>XR</th> <th>XS</th> <th>XT</th> <th>XU</th> <th>XV</th> <th>XW</th> <th>XX</th> <th>XY</th> <th>XZ</th> <th>YA</th> <th>YB</th> <th>YC</th> <th>YD</th> <th>YE</th> <th>YF</th> <th>YG</th> <th>YH</th> <th>YI</th> <th>YJ</th> <th>YK</th> <th>YL</th> <th>YM</th> <th>YN</th> <th>YO</th> <th>YP</th> <th>YQ</th> <th>YR</th> <th>YS</th> <th>YT</th> <th>YU</th> <th>YV</th> <th>YW</th> <th>YX</th> <th>YZ</th> <th>ZA</th> <th>ZB</th> <th>ZC</th> <th>ZD</th> <th>ZE</th> <th>ZF</th> <th>ZG</th> <th>ZH</th> <th>ZI</th> <th>ZJ</th> <th>ZK</th> <th>ZL</th> <th>ZM</th> <th>ZN</th> <th>ZO</th> <th>ZP</th> <th>ZQ</th> <th>ZR</th> <th>ZS</th> <th>ZT</th> <th>ZU</th> <th>ZV</th> <th>ZW</th> <th>ZX</th> <th>ZY</th> <th>ZZ</th> <th>AA</th> <th>AB</th> <th>AC</th> <th>AD</th>	TW	TX	TY	TZ	UA	UB	UC	UD	UE	UF	UG	UH	UI	UJ	UK	UL	UM	UN	UO	UP	UQ	UR	US	UT	UU	UV	UW	UX	UY	UZ	VA	VB	VC	VD	VE	VF	VG	VH	VI	VJ	VK	VL	VM	VN	VO	VP	VQ	VR	VS	VT	VU	VV	VW	VX	VY	VZ	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	WK	WL	WM	WN	WO	WP	WQ	WR	WS	WT	WU	WV	WW	WX	WY	WZ	XA	XB	XC	XD	XE	XF	XG	XH	XI	XJ	XK	XL	XM	XN	XO	XP	XQ	XR	XS	XT	XU	XV	XW	XX	XY	XZ	YA	YB	YC	YD	YE	YF	YG	YH	YI	YJ	YK	YL	YM	YN	YO	YP	YQ	YR	YS	YT	YU	YV	YW	YX	YZ	ZA	ZB	ZC	ZD	ZE	ZF	ZG	ZH	ZI	ZJ	ZK	ZL	ZM	ZN	ZO	ZP	ZQ	ZR	ZS	ZT	ZU	ZV	ZW	ZX	ZY	ZZ	AA	AB	AC	AD
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lengthy entries are permitted, but these features can result in leftover characters staying on the screen temporarily.

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General Appeal

Lost Colony is a negative incentive game. Assign too few people to work the fields, and starvation and unemployment result. Fail to locate mining or energy resources, and all production stops; distribute too few consumer goods, and workers threaten strikes. There are no visceral rewards such as killing a troll or finding a treasure, and not even congratulations or thanks for guiding the colony through another year.

Playing in constant fear of failure and with no tangible rewards can be depressing. It would be interesting to have some perks built in, such as a slush fund or secret hank account that could be incrementally increased each successful year. The money could be used to buy off strike leaders, to buy votes of confidence when the populace wants the manager kicked out of office, or to purchase a charming country home for retirement.

For now, graft and corruption aren't part of the game. Satisfaction has to come from knowing you have done your best or proving you can whip this program.

LOST COLONY

is a negative incentive game.

Overall, Lost Colony is a unique, challenging game. The game provides a glimpse of the vicissitudes of power and authority. After successfully guiding the colony past the first few years, a player can get a feeling of pride and accomplishment. As the author says in the manual, "Once you master this game perhaps you will want to apply to the President's Council of Economic Advisors." Maybe not—it

wouldn't be much of a challenge after playing Lost Colony.

PODLASERIUM

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List Price: \$34.95

Requires: 64K, one disk drive

Age-group: 8 to adult

Number of Players: One

Zap-and-dodge games such as Space Invaders must still be popular, because there is a new one out called Podlaserium.

A shooter slides left or right along a horizontal line at the bottom of the screen, representing Earth, and fires straight up at nasty alien attackers. The player begins with 25 units of fuel and 25 units of ammunition. Each shot consumes one unit of ammo; fuel is consumed whether Earth's defenders move or not. A fresh supply of fuel is awarded for each 1,000 points and additional ammo is awarded for each 2,000 points.

Enemy aliens drop four fiendish types of "pods" into the sky above Earth. Once in place, these pods do not move and can be picked off at leisure. The pods occasionally fire missiles that destroy large amounts of the defender's fuel and ammo, but the attacks are sporadic and can easily be avoided. If the aliens amass a large force of undestroyed pods, "shields" of horizontal and diagonal dashed lines appear. The player can blast these shields at the expense of precious ammo. As a bonus, a "pod bomb" appears during the later stages of each round. If it is detonated, all pods on the screen vanish.

The game is over when the player runs out of either fuel or ammo. A counter then sweeps the sky and deducts points for any aliens not destroyed. The object of Podlaserium is to vaporize pods and score enough points to continue play. Simple, right? Yes and no.

Blasting pods is easy—just line up the shooter with immobile targets—but it soon becomes clear that zapping all the pods is dangerous. Only certain pods should be zapped, and as soon as possible before they hide behind other pods or shields. Meanwhile fuel and ammo constantly disappear. One useful feature is the graphic indicators that show how much fuel or

ammo remains. The pod bombs are also a good idea; it's fun to nail one, but watch the indicators or it will cost too much ammo to drill through the shields that surround each bomb.

Ease of Use

Podlaserium is quite easy to play. Press F9 to move left, F10 to move right, and F7 to fire a laser blast. Should interplanetary warfare make a player thirsty, the F4 key freezes the action to allow a short break.

This version of the game is the new 1.1 program, which replaces the 1.0 program.

PODLASERIUM

is another version of the zap- and dodge-game.

David Peterson of DP Computer Services reports that copies of the 1.1 program were sent to all who had purchased the original 1.0 program. This is a most welcome exchange because the original version required buyers to sign a user contract with strict infringement penalties. The 1.0 version was also written in Advanced BASIC and plays much slower than the 1.1 version, which is written in machine language.

The updated version has greatly improved the original version, but it still needs further refinements. The few minor quirks are not too distracting. Even so, this latest edition of Podlaserium suffers in comparison with other motor-coordination programs.

Three photocopied pages of instructions are supplied with the software, but they are hardly necessary since each new game requires the user to go through the entire instruction procedure. At least the program demonstration is optional. This repetition is a major nuisance and should be corrected immediately.

Use of Graphics

Podlaserium shows up clearly on the monochrome monitor. The instructions indicate that resolution is slightly less definite for color screens.

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Error Handling

The game does a fair job of preventing errors. The keyboard is locked out during play except for the function keys used in the game and the keystrokes those functions represent.

Warranty Support

DP Computer Services will replace a defective disk within 45 days of purchase. The manufacturer also says that it will work out solutions to problems that occur after the warranty period.

Podluserium can be mastered after a few rounds. The game has potential as a children's game, but adults will quickly become bored. On the evolutionary scale, Podluserium is somewhere between Pong and Space Invaders. It is difficult to imagine any improvements making the game more interesting. Podluserium may be destined to join the multitude of games that have become innocuous toys for youngsters to cut their computer teeth on.

FOOTBALL PREDICTOR '83

C & C Software, Inc.
West Bearden Office Plaza
316 Nancy Lynn Cr. #26B
Knoxville, TN 37919
(615) 584-9774
List Price: \$39.95
Requires: DOS 1.10
Age-group: 14 to adult
Number of Players: One

Many people love football. Some revel in the crunch and thud of bodies slamming into the turf; others prefer the crowds, noise, and beer. Some are closet mathematicians who see football as a source of statistics, and some use those statistics to help them place a friendly wager or two. It is these last two groups of users that Football Predictor '83 aims to please.

Football Predictor '83 is more like a bookkeeping program than a game. The program enables the user to compare one football team with another. Vital statistics such as per game yards passing/rushing, offensive first downs per game, interceptions/fumbles per game, and even key injuries are entered into the program, which then factors the variables and projects a score for the next game between the two teams.

Football Predictor '83 offers three levels of evaluation: The first looks at offen-

sive and defensive records; the second and third levels provide more complete analyses and naturally require more detailed information.

After each team's stats for a particular level have been logged in, the program gives a predicted score and asks whether the user would like to proceed to the next

FUMBLE JUST
one digit, and you
start all over again.

level or compare two other teams. When the third level comparison is complete, the predicted final score is given, and four interim evaluation scores are displayed that compare each of the two teams with the rest of the league.

Ease of Use

Football Predictor '83 should not be tough to use, but it is. No bookkeeper would dream of filling in a balance sheet without having a large eraser nearby, but the program demands perfection from the user each time an entry is made. Fumble just one digit and you start all over again, even if you've run almost all the way through level three. This can be annoying if you're a clumsy typist or lost in thought computing figures. What's worse, the same thing happens if "No" is keyed in to certain prompts. Instead of offering a chance to continue play without losing the information and results already recorded, the program simply ends.

Ideally, this program should include a VisiCalc or SuperCalc ability that would enable the user to switch around variables and entire team stats to make more efficient comparisons. The user could then add each week's stats into the totals accumulated from previous games and have updated figures at hand. It would also be possible to eliminate the endless computing of statistical averages. This innovation would transform Football Predictor '83 from a 97-pound weakling into a 300-pound offensive tackle.

Documentation

Three photocopied pages of instruc-

tions accompany the disk. The instructions are the bare minimum; the manufacturer had to be called just to get the entry code for the IBM PC. (The manufacturer says that this should be included on any recently purchased Football Predictor '83 program instructions.) Most problems are minor and can be figured out, but it shouldn't be necessary to do that. For example, under key injuries, the prompt asks, "What type of injury?" when it should be asking which player is injured. Could a coach do a good job without a decent playbook? These instructions should be benched until they can demonstrate the basics of Football Predictor '83.

The user must do much of the paperwork. A statistical organizer, which lists variables included in the evaluations at each level, is included with the instructions. The best strategy is to compute all the averages and record them in the statistical organizer before punching them into the program. All the program really provides are the formulas for weighing the factors.

Accuracy

Football Predictor '83 seems to operate well within its limits. Without knowing the formulas involved in the calculations, verifying the program's accuracy would be as tough as kicking a 90-yard field goal. When identical stats are entered for both teams, the program gives the home team the edge. Stats that noticeably favor one team repeatedly predict that team the victor. At least on a primitive level, which is the level at which programs of this type

portance of the game, and accuracy of the referees. The manufacturer warns users that Football Predictor '83 is for entertainment only.

Error handling is where Football Predictor '83 is thrown for a loss. The program is very unforgiving of errors. If the wrong number is entered, the user will be sacked. A conservative game plan is in order.

For an otherwise dry and straightforward program, Football Predictor '83 has at least one humorous response to a ridiculous entry: When too many key injuries are entered, it replies, "That's a lot of injuries. Better stay away from that game."

Warranty Support

A spokesman at C & C Software said that if the disk is defective it should be sent back, and a replacement will be mailed. The manufacturer is also willing to answer questions over the phone.

General Appeal

Whether Football Predictor '83 is a success can be judged by sending it into the field. If it can prove itself on the gridiron (does anyone call it that anymore?), then it will be certain to win a place in the hearts and wallets of gamblers and "stats rats" everywhere.

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VERIFYING
 the program's
 accuracy would be as
 tough as kicking a
 90-yard field goal.

operate. Football Predictor '83 appears consistent. What the program doesn't show are numerous other variables that affect athletic competition: weather, minor injuries, playing surface, mental and emotional condition of the athletes, im-

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DEADLINE

Infocom
55 Wheeler St.
Cambridge, MA 02138
(617) 492-1031

List Price: \$49.95

Requires: 48K, one disk drive

Age-group: 14 to adult

Number of Players: One

The dead man in *Deadline* is the millionaire philanthropist Marshall Robner, killed by an overdose of ebullience, a powerful antidepressant. Suicide is suspected, but there are no unanswered questions. It is the Inspector's job to conduct an investigation and to determine whether Robner's death was an accident, a suicide, or the result of a heinous murder.

The investigation begins at the Robner estate at 8 a.m. The Inspector (player) has only 12 hours in which to interview the people who live and work there, search for clues overlooked by the police, and uncover evidence leading to a possible suspect.

A dossier labeled "Documentary Evidence" contains the particulars of the case: a letter from the deceased's attorney, the coroner's report, a lab report, a photograph of the location at which Robner's body was found, tablets found near the body, some official memos, and transcripts of interviews with Robner's wife, son, secretary, business partner, and housekeeper. The dossier also includes the Inspector's Casebook (also known as the instruction manual), an IBM Interlogic Reference card, a warranty card, and, of course, one floppy disk. Information contained in the casebook is vital to the success of the investigation.

PLAYERS HAVE
been known to
without food or sleep
until the case has been
solved.

Use of Graphics

Just as a good mystery story needs no illustrations, *Deadline* neither has nor needs graphics. The program stimulates

players' imaginations with verbal descriptions and the enigma of a Sherlock Holmes mystery.

Error Handling

Deadline is not without its limitations. A player will find it difficult to question the characters involved unless the questions are carefully and politely worded. *Deadline* will not accept peculiar input. Commands must be phrased carefully or the program will respond, "Come again?" or "I'm sorry, I don't understand that."

The Inspector deals with people who

THE PLAYER
has only 12 hours
in which to solve
the murder.

are undergoing great stress. Some may be reluctant to talk to the police, and one of them may be a murderer. Failure to proceed swiftly in a logical and orderly manner may result in the loss of valuable clues or in the death of another person—even the Inspector.

Warranty Support

Deadline will quickly reveal one thing: It is a program of the highest quality. The program is thoroughly researched and tested, and it is virtually flawless. Infocom, Inc. provides a limited warranty that covers the performance of the disk for a period not to exceed 90 days from the date of purchase.

Deadline is an interesting, sophisticated program with a wide range of responses that guarantee that each play of the game will be fascinating and unique. The pleasures of discovering clues, building a case, and outwitting a fiendishly clever murderer should provide entertainment and challenge enough for any detective. Players have been known to do without food or sleep until the case has been solved. Rumor has it that Infocom, Inc. has even more difficult riddles of detection coming in the near future

/PC

Richard Cook is a free-lance writer based in San Francisco.

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List Price: \$89.95

Requires: 48K, one disk drive, 80-column monitor

Age-group: 13 to adult

Number of Players: One to seven

Gambling aficionados may be familiar with Ken Uston's systems for beating the odds at blackjack. Those systems can now be used on the PC in the form of Ken Uston's *Professional Blackjack*. It promises to hone players' skills, give advice and special tips based on Uston's theories, and simulate the action of the real game.

Professional Blackjack is only one of many tools players can use in their unending quest to beat the dealer. Of course, this game does not cover everything: Players must still find some way to avoid detection by the management, since casinos hire burly men with no necks to escort system blackjack players to the door.

The program operates in two modes: drill and play. In either mode the gamblers must decide where to play: the Vegas strip, downtown Vegas, Tahoe/Reno, or Atlantic City. Once these high-rollers hit town, they may choose the exact casino. In Ta-

hoe/Reno, for example, they are given a menu showing a few dozen establishments, such as Barney's, Harrahs, and the Sahara.

BBLACKJACK
rules vary
considerably from
town to town and
casino to casino.

Players can also invent a mythical casino and customize the game according to their own rules. Blackjack rules vary considerably from town to town and casino to casino. Some casinos use one deck and cut it after half is dealt. At others, three or more decks are used, and they are cut 80 percent of the way through. These variations can either stack or whittle the odds for a player, depending on that mysterious recipe of skill, instinct, and plain old luck.

Professional Blackjack is a complex

program; the following description simplifies some points. Once the location and corresponding rules of play are established, the player chooses either drill or play mode.

There are two kinds of drill: card counting and practice hands. In card counting the computer displays cards one at a time at a speed chosen by the player. The player must remember which cards have been dealt, paying special attention to the number of aces. Players can check their memories at any time by pressing a key that will display a count of which cards have been dealt.

Practice drill, on the other hand, is what its name suggests: Practice makes perfect—and maybe a little money. Players are allowed to see the dealer's up card and two dealt cards, and may then choose a play: split, double down, hit, or stand. If they choose the wrong play, the computer beeps and the players can call up a color-coded display that tells them the correct move.

When players switch from drill to play mode, they can elect to play head to head with the dealer, or with up to six other gamblers at the table. The computer can act as the dealer, or it can assume the roles of any or all the other gamblers. Each player can also choose to play one or more of the gamblers' hands. The game proceeds exactly as it does at the specified casino. Players bet, make their moves, and win or lose. Cards are turned over or discarded





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unseen at virtually the same speed as in an actual game. Both computer and players follow one of the four Uston systems, which vary in difficulty only.

Ease of Use

Considering the program's complexity, the game is quite easy to play. Getting through the whole game—choosing drill or play, a location and a casino, which Uston system to play, the number of players and size of their stakes—requires several levels of programming structure, which means several different menus. Fortu-

PROFESSIONAL Blackjack's carefully designed training program allows a player to practice crucial skills.

nately, the hierarchy of menus is presented logically. The program may be used without reading the documentation, but a player would then miss a chance to appreciate *Professional Blackjack's* unique capabilities.

Documentation and Packaging

Professional Blackjack comes in a hefty plastic case that is appropriate for bookshelves. The case even opens as a book and contains an extruded plastic compartment for the disk and documentation.

The documentation consists of two professionally prepared manuals. One is an eight-page booklet of operating instructions for transferring DOS to the game disk. The instructions are complete and accurate, as are the descriptions of menus and playing options. However, the pages are not numbered, an oversight the manufacturer plans to correct. The other manual is 47 pages of text and color-coded charts that tutor the user in all four Uston systems. Although the writing style is clear and concise, information-packed pages are printed in small type, which can be a strain on the eyes. Charts are straightforward and use a code consisting of four colors that correspond to tactical options during play.

Incidentally, the operations manual mentions a newsletter, *The Experts*, for true blackjack devotees. The newsletter keeps readers informed about the rule changes frequently made by casinos.

Use of Graphics

The graphics in *Professional Blackjack* are simple and functional. Drill cards are large and take up about one-sixth of the screen. Face and number cards are marked with only the suit emblem and the number, making them easy to read. The playing table is a green field; white rectangles represent the players. Each rectangle contains the size of the stake, or "wallet" as it is referred to in this program, the size of a betting unit, the amount of the current bet, and the player's name. Cards dealt to the players and to the dealer are like the cards in drills, only smaller, and they can be read easily. Clarity of design is especially important when the program is used to train a player to count cards.

General Appeal

Professional Blackjack's carefully designed training program allows a player to practice crucial skills. A player can work on remembering cards as they appear, one by one, and then perfect card counting in a simulated game while cards go by in the sequence and at the speed they would in a casino.

Professional Blackjack is a realistic game for players to enjoy in their own homes. While the thrill of winning may not match that of Vegas, the armchair gambler can lose with impunity; another fortune is available at the push of a button.

Accuracy

Professional Blackjack meets high standards for accuracy. The bets and wallets of up to seven players are monitored flawlessly, and the program neither forgets a card that has gone by nor thinks one has gone by when it hasn't. This reviewer detected only one flaw: Despite a menu option to turn off the sound effects, the program refused to operate silently.

Error Handling

In general, the error handling is excellent. When a player presses the wrong key, the cursor remains in place, the computer beeps, and the program waits for the correct key response. It would be better, however, if a message described the error.

A more serious problem occurs during

the drill mode of the program, in the part that allows a player to practice on randomly dealt hands. Hitting the Esc key at this time calls up a small table that contains statistics on previously dealt cards and information on the Uston system in use. Strangely, when a player employs this memory check and the table appears, some confusion may result. The screen scrolls in such a way that the last hand, still on the screen, moves up. The following hand fails to cover it completely, leaving the edge of two cards cluttering the screen. This is an unfortunate programming mistake in an otherwise professional piece of work.

Warranty Support

The warranty on *Professional Blackjack* is a standard but skimpy one, and is printed inconspicuously inside the front cover of the operations manual. The wording is concerned exclusively with denying liability for a number of eventualities; there is scant resemblance to a buyer protection warranty. However, the manufacturer does say that a damaged disk will be replaced within 90 days of purchase. Even after 90 days it will replace any disk for 20 percent of the current retail price.

Despite two or three flaws, *Professional Blackjack* is a superior product. The intelligent design strikes a good balance between practice and play; practice drills are detailed and useful, while play is realistic and exciting. The program deals hands, disposes of bets, and picks up cards exactly like a live dealer. Only the chatter and free cigarettes are missing.

MIDWAY CAMPAIGN

Avalon-Hill Game Company
4517 Harford Rd.

Baltimore, MD 21214
(800) 638-9292

List Price: \$21

Requires: 48K, one disk drive

Age-group: 14 to adult

Number of Players: One

Midway Campaign is a video game recreation of the epic naval battles of World War II. The object of the game is to sink the Japanese task forces before they can return the favor. The field of battle consists of only one display throughout the game: a 12x12 grid of dots. Within this less than realistic depiction of the South Pacific is

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the letter M, the American airbase on Midway Island. To one side of the grid are the numbers 7 and 6, representing the American task forces of three aircraft carriers: the Yorktown, the Hornet, and the Enterprise.

As enemy ships appear, they too are represented by numbers. Each carrier has three types of aircraft that can be moved between the flight decks and storage bays, armed, and then launched. Once aloft, they are assigned to air patrol or face harrowing dogfights with formidable Japanese pilots.

The game is strictly player versus computer. Tactical decisions include when to bring planes up to the flight deck, in which direction to sail the two task forces, how many of each kind of plane to launch in an attack, and how many planes to keep on patrol.

When the Midway airfield is bombed into a smoldering wasteland, the Hornet is sunk. And when its returning, now homeless, fighter squadron splashes down, players will wish they had gotten a 4-F.

Ease of Use

Luckily, Midway Campaign is easy to use even without reading the documentation, as this reviewer discovered upon finding that none came with the sample copy. It required about 45 minutes of trial and error, and not a little deductive reasoning, to get it under way. Even then the wily enemy scored victory after victory, but a rematch should yield a different ending.

Documentation and Packaging

Midway Campaign comes in the standard Avalon-Hill package—a plastic tray within a cardboard box. The box bears an eye-catching artist's rendering of a World War II attack aircraft flying over a burning battleship. Like most computer game packages, this one is an exercise in deceptive hyperbole. The actual game display is far more abstract than the picture on the box. On the positive side, Avalon-Hill game disks can be copied, and the user is encouraged to make backup copies.

Use of Graphics

The game makes no use of graphics other than the grid of dots and the letters and numbers mentioned previously. Adjacent to the grid are status charts showing the number of aircraft on each carrier and

on Midway, the headings of each task force, their distances from Midway, and so on. As players spot the attackers, information about them as well as the date and time of day are displayed. The latter is especially important because after nightfall attacks cannot be launched, but both sides can maneuver their ships.

General Appeal

This gripping game creates tension but leaves the player ready for more. One serious problem occurs, however, during at-

PLAYERS NEVER
know when the
whine of an incoming
shell will signal an
unexpected attack.

tacks on the enemy. The results of those attacks—number of hits on enemy carriers, number of aircraft destroyed, secondary explosions, carriers sunk—flash by so quickly that they are unreadable, thus depriving combatants of vital information. Another puzzle is that the enemy sometimes sustains hits and damage when no attackers are aloft.

Accuracy

The basis for scoring in Midway Campaign is a mystery. Even after playing two long games, it was not apparent how the score squared with the action. Were too many planes sent out? Too few? The wrong kind? The damage inflicted on the enemy also bore no discernible relationship to battle strategies, leading this reviewer to suspect overuse of Programmer's Temptation, the old random generator. This is cowardly sneak-scoring, which will live in infamy!

Error Handling

This program cannot be broken by anything a player enters. Even a kamikaze elbow to the keyboard failed to elicit more than a polite beep—no air raid siren, no angry searchlights, just a beep.

Warranty Support

After calling Avalon-Hill with a fictitious complaint about a copy of Midway

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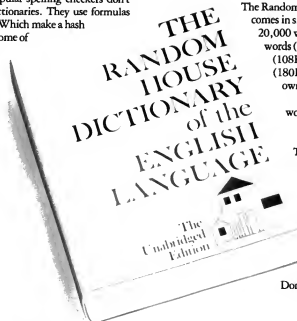
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Campaign that would not run, this reviewer was assured that if the disk were faulty or damaged, it would be replaced free of charge. Usually the exchange takes 2 to 3 weeks by mail.

Midway Campaign is enjoyable, particularly for those with a bias for text games. The lack of graphics might put

sured by a digital clock in a corner of the screen. Simple enough; perhaps too easy? A game that can soon become tiresome? On the contrary. A player need only make the first move to get hooked.

The addiction begins simply: keep beating the fastest time through the maze. But then it deepens because the dead ends are ubiquitous: a red wall at the end of two long, green walls that are themselves the end of a myriad of other, unseen walls. The confusion intensifies and the dead ends become alarmingly familiar: the inti-

mate and dreadful knowledge that comes from wandering in circles.

Ease of Use

Treasure Hunt is self-booting and is exceedingly simple to play. The player determines all direction and motion by using five of the keys on the number keypad. With single strokes of other keys a player can end the game, start a game with a new, random floor plan and reseeded treasures, rehearse the treasures and reset the clock but keep the same floor plan, or dis-

A PLAYER need only make the first move to get hooked.

some players off, but the game is suspenseful enough to stay interesting. After all, players never know when the whine of an incoming shell will signal an unexpected attack, and they can never be sure how many friendly planes will return.

TREASURE HUNT

Ensign Software
2312 N. Cole Rd., Ste. E
Boise, ID 83704
(208) 378-8086

List Price: \$19.95

Requires: 64K, one disk drive, 80-column monitor and graphics adapter

Age-group: 10 to adult

Number of Players: One

The idea behind *Treasure Hunt*, a game of memory and spatial relationships, is simple, but playing the game is anything but simple.

A player is represented as a medium-resolution humanoid standing inside a labyrinth whose red and green walls extend in perfect perspective to the horizon, which is actually another wall. Down a central corridor other passages branch out on either side, some leading only to dead ends. Although the labyrinth is completely enclosed, the point of moving through it is not to escape, but to find ten gold cubes. These "treasures" contain other valuables and are placed along the labyrinth's hallways, visible only at close range.

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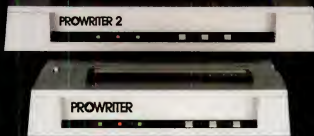
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play a model of the floor plan as seen from above. The latter is an aid to those with a muddled sense of direction. It comes in three versions: a birds-eye view of the immediate area only, the entire floor plan, or a trail of green dots showing those parts of the maze already covered. In each case, a player's location and direction are marked by a small red arrowhead. [This reviewer

CONFUSION *intensifies and dead ends become alarmingly familiar.*

played the game on an RGB monitor; colors on a television may vary from these.]

Documentation and Packaging

The package is a simple, fold-over cardboard envelope with a pocket for the disk. The brief instructions are printed on the outside of the envelope, as are the hardware requirements, which note that "graphics" are required. The novice player may not realize the implication, namely that this game will not be visible on a monochrome display, a fact that should be spelled out explicitly.

Use of Graphics

As the foregoing discussion infers, *Treasure Hunt* is all graphics, and they are very good. The perspective of the walls creates a convincing sense of depth and is quite realistic. As a player moves, the walls go by on either side; movement is as fast as it can be on a microcomputer. Between moves, however, the screen must be withdrawn because the player has moved. Although fast by micro standards, the required wait is irritating.

The drawing sequences are curious. The labyrinth, defined entirely by a data base, is actually a section of that data base drawn in a logical order. As a result, part of the maze that lies behind a wall often appears before the intervening wall is drawn over it. A player can often catch a fleeting glimpse of a corridor that should be invisible and may sometimes even spot a treasure before the foreground is drawn in to obliterate the view. Whenever the

game begins, the program draws the screen [this can take as long as 2 seconds], handicapping a player's time before he or she can make a first move. Finally, the red arrowhead, which serves as a player's direction finder, is visible even during a move, while the floor plan itself disappears. The arrowhead is a memory aid that ought to stay invisible until summoned. There is one more flaw: The tunes that accompany the discovery of treasures cannot be turned off. These should also disappear on command.

General Appeal

Treasure Hunt achieves the highest goal of a computer game—to evoke real emotions. The excitement of a quest and the thrill of discovery are palpable. At first glance, *Treasure Hunt* looks as though it could lapse quickly into tedium, but its looks are deceptive. This reviewer's involvement grew steadily, heightened by each successive game.

Accuracy

Treasure Hunt does what it promises, exactly as it says it will. The only "moving" part, the clock, keeps correct time, and all the keys function as intended. However, the distribution of the treasures is so random that five of the ten were once within a few steps of each other. Another minor flaw is that some mazes seem much easier than others, although in most mazes the first three or four treasures are easy to discover.

Error Handling

Although an attempt to cause errors was unsuccessful, two minor points should be made: The NumLock key does not toggle the keypad between use as a numerical input and use as directional input via the arrow keys. The programmer has disabled this function of the NumLock key. If a player does hit the NumLock key, the next key hit will be ignored and will have to be hit twice. In addition, the zero key stops the game in progress in order to start a new one. It is catastrophic to hit the zero key unintentionally, and good programming technique dictates that catastrophic keystrokes be made difficult. The program might have required, for example, that a player hit the Ctrl and zero keys simultaneously to abort the game. This would make accidents much less likely.

Warranty Support

Treasure Hunt offers a standard warranty; if the disk is defective, it will be replaced, but otherwise you're on your own. In fact, the replacement guarantee is not spelled out on the warranty notice printed on the packaging. Ensign Software assured this reviewer over the phone that the replacement offer is detailed in the retailing package sent to dealers.

Treasure Hunt is a terrific game because of its uncanny ability to create excitement and tension. It may be a computer simulation of a hunt for electronic jewels, but the real treasure is the emotional response, which is easy to find.

LAS VEGAS BLACKJACK

Quala

1014 Griswold Ave.

San Fernando, CA 91340

[213] 365-9526

List Price: \$39.95

Requires: One disk drive

Age-group: 13 to adult

Number of Players: One

Las Vegas Blackjack is a computer simulation of the famous card game. It is designed for IBM PC owners, ostensibly so they can sharpen their betting, card counting, and other blackjack skills to become good enough to beat the house. The slick booklet that comes with the game says brashly that "if you can win against the computer, you should be able to win at the tables on the strip."

Had P.T. Barnum lived to own a computer, he might have used it to calculate the mean average ratio of suckers born per chronological live birth. The answer is still one a minute. In short, *Las Vegas Blackjack* is the descendant of a long and illustrious line of snake oils.

To be fair, however, the game does play blackjack. It will also keep track of players' bank rolls, the amount of their bets, and their winnings and losses. It will deal two hands: one to a player and one to the dealer. Unfortunately, a more realistic *Las Vegas*-style game with several players is not possible with the software used.

Ease of Use

Blackjack is a simple game. A player bets, the hands are dealt, and the winner is the player whose cards add up to the highest number, as long as it is not over 21. *Los*



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Vegas Blackjack, however, is difficult to play because it has more bugs than Panama in the rainy season, and at least one of those bugs is a killer. In one respect, this game is easier to use without the documentation because the instructions for running the game result in failure. Overall, however, reading the documentation before playing makes things easier.

Documentation and Packaging

The packaging consists of the disk and the booklet in a zip-lock plastic bag. The disk was protected by two squares of corrugated cardboard. This may just be mail-order packaging, or it may be a sign of a product rushed to market woefully untested and unfinished.

The booklet's cover shows a full-color drawing of two women in gowns with plunging necklines. One of them is an entertainer; the occupation of the other can only be surmised. A smug young man with a fistful of greenbacks sits behind a pile of chips. A PC is in front of him, and behind him is what the viewer must believe is a blackjack hand: a queen, a jack, and an ace. These are the first real clues to the value of this game because only a rube would hold such a hand. Anyone even slightly familiar with blackjack knows that an ace and a face card is a pat winner, and two face cards are the next best thing. Players don't need a computer to tell them not to draw a third card in either of those situations.

The manual is clear and concise, except for the warranty and "licensing agreement," a full page crammed with small print and legalisms. The booklet is over 30 pages long, but its layout makes it easy on the eyes. It includes the rules of blackjack and some tips on playing. Its two appendices, corrected by an enclosed errata sheet, give instructions on transferring PC-DOS and BASICA to the game disk.

Use of Graphics

Las Vegas Blackjack uses low-resolution graphics and alphanumeric characters for the character set as counters. Chips are represented by the tiny faces included in the PC character set. A player's bankroll is a stack of rectangles that increases or decreases depending upon the outcome of each hand.

Mild visual interest is added by having the chips at stake move from player to dealer or vice versa. If a player opts to turn

on the sound effects, a loss prompts a dirge and a win produces a fanfare. Numbers are displayed on the screen so that a player need not depend on graphics to keep track of chips, which would be impossible in any case because the graphics are only meant as window-dressing representations.

The cards themselves are well-drawn, high-resolution figures that show numbers and suit emblems: diamonds, spades, hearts, and clubs; but there are no pictures on the face cards.

Current versions of the game, 1.05 and higher, support full-color graphics with a color monitor and a color adapter.

General Appeal

The game scores highly in this category; it has the appeal of the real thing, especially for the gambling enthusiast. In one game this reviewer built \$10,000 into \$40,000 before quitting. The following game saw \$10,000 jump to \$36,000 when the dealer figuratively died (see Error Handling). Nevada has seldom seen win-

ning like that!

Accuracy

Up to a point Las Vegas Blackjack is credible, particularly if players want to pretend they're betting a hand in a desert casino. But in Las Vegas players are seldom alone at a table. Other players are dealt their share of the cards, some of which are up, some of which aren't, and this has a significant impact on betting strategy. In Las Vegas Blackjack only the computer and the player square off. In the same vein, if players in Vegas have a pat, winning hand, a blackjack, or an immediate loser (a sum over 21), the game is over; the dealer takes the money and deals the next hand. In this game, however, the "dealer" shows players what it's holding and, incredibly, when a player goes bust, the dealer continues to give itself cards.

Programming irregularities aside, the game keeps track accurately enough. The computer doesn't palm any chips, nor is tipping necessary. This is refreshing, but it's not Las Vegas.

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Error Handling

Error handling is the worst aspect of *Las Vegas Blackjack*. Without getting into programming jargon, the method for accepting input is the easiest but sloppiest of those available in BASIC. As a result, invalid input causes an error message on the line below the cursor. The user may input again, but then everything is two lines lower. With enough errors, the entire display could scroll off the screen. Even worse, the error messages are not erased; they may accumulate and clutter up the screen. This unforgivably sloppy program-

ming can leave the player in limbo, with no directions on how to proceed. What's more, at least one error is fatal. When this reviewer bet a bankroll of \$36,000, an overflow error appeared and the program aborted. Come to think of it, maybe this was a belated attempt at realism. In Vegas the pit boss usually throws out a customer who threatens to break the bank.

Warranty Support

Quala's warranty is similar to most software warranties—limited. If a defective disk is returned within 90 days, it will be

replaced, provided the sales receipt is used as proof of purchase. No sales receipt—tough luck.

Las Vegas Blackjack allows a player to choose the number of decks used and the frequency with which they are shuffled, simulating the tactics used by casinos to thwart players who employ card counting and other devious means of trying to turn the odds in their favor. A player can't beat the house, even with the chart of favorable odds on the back of the slick instruction booklet. But none of this matters, because the directions for transferring BASIC to the game disk do not work. The only way to play this game is to boot BASIC separately and then run the program file, listed in the directory as "blackjack."

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GALAXY

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List Price: \$25

Requires: 48K, one disk drive

Age-group: 14 to adult

Number of Players: One to 20

Galaxy's package cover has a dramatic picture of starships flying in formation across the crater-pitted surfaces of two mysterious planets. Unfortunately, the picture is the most exciting thing about the game.

Avalon-Hill, a prolific manufacturer of board games, designed Galaxy much like the game *Risk*: the only difference being that games like Galaxy are played solely against a computer. At the start of play, each of up to 20 players owns one of a possible 40 worlds. Each world provides a player with a number of spaceships that can be sent to capture other worlds, thereby gaining more spaceships with which to capture still more worlds.

The game has two basic playing strategies. One consists of striking a balance between the number of spaceships sent out and the number kept home to defend worlds that the player already owns. The other strategy is a matter of concentrating offensive and defensive forces. When two forces clash, the computer provides a random "gunnery" factor, which is meant to simulate shooting accuracy. In practice, the number of ships brought to bear far outweighs the gunnery factor and, despite

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Asylum supports **printer output**. If specified, all input and messages will be printed without slowing down the game. Among other things, it allows you to print the dictionary and/or your inventory at any time. A **panic button** allows those of you playing on the job to emergency abort, and later restore, a game in progress (our apologies to your superiors). **SAVE GAME** allows up to 100 games to be saved on your disk. Since Asylum requires months of work to solve, saving allows you to resume a previously adjourned game.

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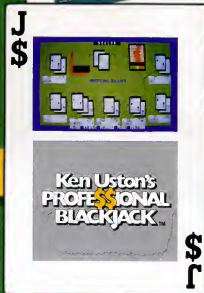
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48K RAM, disk drive, 40-character display.

Display shown is actual photograph of IBM PC color version. Other versions vary with hardware limitations.

Versions for C/™, Atari™ and TRS-80™ should be available before Christmas.

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GROWN-UP GAMEWARE™

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a disclaimer in the instructions, the defender, who always shoots first, enjoys a considerable advantage.

The only excitement in *Golox* comes in watching an evenly matched battle; all others will be won by the player with the most ships. But even this limited excitement is diluted by the slowness of combat, unless the sound effects are turned off. The action is then speeded up, but only the battle noises are silent, not those that accompany the rest of the game.

Ease of Use

Golox can be played on either a color or monochrome monitor. The program calls for a color monitor, but the color contributes little, if any, to the game. Booting the program is simple but immediately produces a "device not available" error. The computer refuses to play unless a line printer is plugged in. Some creative programming can bypass the problem, but a bug like this in a product designed for garden variety consumers is unacceptable. Otherwise, the game is easy to play, even with a cursory review of the instructions.

Documentation and Packaging

Golox's packaging is professional and attractive. The four pages of instructions are clear, although they are not written for the IBM PC. The instructions would have been sufficient except for the lack of documentation about the aforementioned bug.

A more serious problem is that the instructions are not detailed enough. The rate at which new spaceships are manufactured over time is not given in the instructions. As a result, the display showing the number of ships available in a given year is sometimes surprising. Having 80 ships and expecting 30 is fine, but having 30 and expecting 80 sends every player scurrying to the instructions for help. Alas, such a search is in vain.

Use of Graphics

Graphics consist solely of two displays: a "star map" that consists of a grid of dots interspersed with letters representing the various worlds, and two boxes representing two worlds in battle, each giving information concerning the status of forces. Not exactly moving pictures.

Accuracy and Error Handling

The game tallies the score accurately. Incorrect entries are greeted with rude heaps, a common, unimaginative error

handling technique. If the player wants to have a quiet game, the speaker plug can be removed, but that would leave no error handling at all.

Warranty Support

After calling Avalon-Hill in Baltimore and complaining about the program bug, this reviewer was told not only that they were unaware of the bug but also what to do about it: One must change the programming listing, something the average user should not be required to do. According to the manufacturer, versions of the game now on the market have had the bug removed. (By the way, Avalon-Hill has a toll-free number for placing orders only. The number for customer service is not listed, and the operator at the office cannot transfer a call to that department, which would ordinarily mean two long-distance calls to

get assistance. Reviewer to the rescue: The customer service number is (301) 592-6016.)

General Appeal

The game could be engrossing if played by enough people with enough imagination to gang up on each other, or to form provisional alliances to vary the balance of power. The only thing resembling suspense in *Golox* is an occasional battle that stays in doubt until the last salvo. Watching two numbers diminish while rooting for one to reach zero before the other is considerably less than a light year's worth of entertainment. *Golox* lacks excitement and it is relatively unimaginative. Even reruns of *Star Trek* have more compelling sequences. Chalk up this failed version as going to the popular galactic well once too often. /PC

GAMES/LINDSY VAN GELDER

Superplayers Run The Gauntlet

If battling cockroachlike Omegabugs, getting blasted by the Galaxy Master, or dodging crazed ax murderers in Asylum sound like your idea of a good time, these three games may be for you.

OMEGABUG

Personal Computer Products
1400 Coleman Ave. #C18
Santa Clara, CA 95050
(408) 988-0164
List Price: \$29.95
Requires: 64K, one disk drive
Age-group: 8 to adult
Number of Players: One

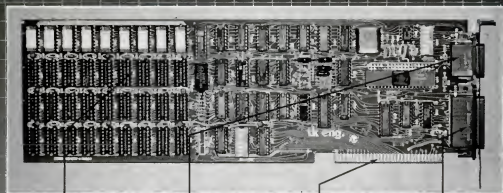
Some say that successful video games are exciting because they evoke fundamental psychological situations. *Omegabug* is a game that proves that even our fears of being swarmed by creepy, crawling critters can be fun.



Omegabug is the name of the villain, a sort of electronic cockroach shaped like the Greek letter omega. It blips horizontally across the top of the screen, descending one line with every pass. The player is represented by a symbol called a Weapon (it

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looks more like two aspirin) that stays on the bottom line of the screen. The player can move to the left or right with the arrow cursor keys on the PC's numeric keypad and can fire with the topmost arrow key. The object of the game is to keep the bug from touching the Weapon while racking up as many points as possible.

Like the best arcade games, Omegabug has several stages. In stage one bugs skitter across the screen and the player literally tries to knock their socks off (those little feet at the bottom of an omega). As the Omegabugs keel over, they are replaced by new ones. Meanwhile the corpses that litter the screen keep piling up until the game begins to resemble a New York City kitchen the day after the exterminator.

As the game moves along, still more gunk piles up on the screen: Live bugs mourn their dead relatives by sticking to them and big blobs of garbage appear out of nowhere. The garbage barriers can be dispersed with two shots. In stage three the Blockers appear; these are big green cursor-monsters that can't be penetrated. If the player hits a Blocker, it multiplies and scatters all over the screen.

In the game's final stage the Droppers enter the picture. These are Omegabugs that plummet vertically, smashing everything in their path. At this stage, players are also terrorized by super-crazy Droppers that zigzag on the way down, forcing the Weapon to race back and forth like a crazed tennis player covering the net.

The previous description is actually a bit oversimplified and doesn't do justice to

game moves with astonishing speed, and the wreckage be damned.

Ease of Use and General Appeal

Omegabug loads automatically once the player has created certain DOS files and entered them onto the disk. The user manual gives clear directions for accomplishing this one-time-only task.

If action/reflex games are the order of the day, Omegabug should draw players as a flame draws moths. Unfortunately, the nature of such games makes them good candidates for an incandescent lifespan: players burn through the game's appeal very quickly.

Documentation

Omegabug's documentation isn't as slick as that of some games, but it gets the job done. Rules and operating procedures are clear and complete, and some strategy tips are offered in the 12-page user manual. The manufacturer reports that the documentation and packaging are being improved.

Use of Graphics

Omegabug takes full advantage of the PC's color/graphics capabilities. Omegabugs, Barriers, and Blockers are brightly colored in proportion to the attention they deserve from the player. The Omegabug, for instance, is an eye-catching yellow. The game also uses the PC's sound capabilities to good effect: The Weapon clickety-clops across its turf (it sounds like a letter quality printer), Droppers whistle like bombs, and Blockers and Barriers burst onto the screen to the tune of upbeat ditties (a la Pucman) that accentuate the quick pace of the game.

Accuracy and Error Handling

The manufacturer has done a professional job with Omegabug. It does what the documentation says it will do, the bugs move the way they are supposed to, and the score is tabulated correctly. Error handling is good. The program will ignore false entries, and a player can return to the system by hitting the Esc key.

Warranty Support

One final but considerate touch: Some companies seem bent on avoiding all contact with the user, but Personal Computer Products invites customers to call "if they

have any suggestions, encounter any problems, or just want to talk to us," according to a spokesperson. The company will also replace a defective Omegabug disk free of charge within 1 year of purchase.

GALAXY MASTER

Info-Pros Incorporated
2102 Business Center Dr.
Irvine, CA 92715
(714) 851-8975

List Price: \$29.95

Requires: 64K, 80-column monitor, one disk drive

Age-group: 9 to adult

Number of Players: One

Galaxy Master is your basic interplanetary shoot-out. The player's spacecraft has 2 minutes to score a minimum of 600 points by firing at the Galaxy Master's ship and at a host of meteors and other assorted space hazards. In the meantime, the Galaxy Master fires back at the player, who loses points according to the number of direct hits taken. The game ends either when the player's 2 minutes run out or when he or she gets zapped by the Galaxy Master.

Ease of Use

The four cursor arrow keys control the movement of the player's spacecraft. A player can fire lasers (which don't go very far but move quickly) or photon torpedoes. The photons go very slowly and the player can't fire a laser while a photon is snailing its way into the skies. Photon hits, however, yield a higher score than laser hits. A player controls the lasers with the F1 key and the photons with the F2 key. The F10 key activates a self-destruct option.

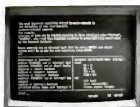
The keyboard controls for Galaxy Master make it necessary for the player to have his or her left hand draped over the function keys in various double-jointed arrangements while his or her right hand is hunched, bug-like, over the numeric keypad. Concert pianists should love this game, but the pinkies of this reviewer got tired waving in the air.

To start up Galaxy Master a player must load DOS, call up the BASICA program on the DOS disk, and then run either of two versions of the game (one with sound and one without). Except for the loading instructions, which are printed on the package, the rules of the game are on

B **BEING**
swarmed by creepy,
crawling critters
can be fun.

Omegabug's helter-skelter feeling. Live Omegabugs that hit Blockers turn into Blockers; moving Omegabugs become stationary when stationary bugs are zapped. Had enough? Omegabug is so busy that most players are overwhelmed by all the debris during their first few games. Ultimately, however, this prolific garbage is a part of Omegabug's strange charm; the

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the disk. ("Earthling, do you know the rules of battle?") Once play has begun, an information line on the bottom of the screen keeps track of the score, the elapsed time, and whether the player is free to fire. At the end of the game Golox Master rates players according to their worthiness as opponents.

I **S THERE** **such a word as user-** **unfriendly?**

Documentation and Packaging

Golox Master's documentation consists of a one-page description on the back of a four-color card. Loading instructions are minimal. One word about the packaging—flimsy. The game comes in a zip-lock plastic bag. Enough said.

General Appeal

Galaxy Master is the type of game this reviewer would have been enchanted with 6 months ago when there was a scarcity of challenging gameware available for the PC. But compared to recent entries such as Omegabug, Golox Master seems a bit cheesey. The spacecraft is represented by dinky typographical symbols that lurch up and down, grid-style. The colors are good, but even on the loneliest of lonely nights, the appeal of little blips going across the screen wanes quickly.

The game gives no real sense of action or mobility, nor is there any way to speed it up or advance to more challenging stages. Perhaps this reviewer's senility is arriving ahead of schedule, but beating Golox Master proved to be extremely difficult.

Warranty Support

The message on Golox Master's packaging reads, "IMPORTANT: This product is not warranted. No guarantee is expressed or implied." I assume that this warning

means that if your disk arrives with a hole punched through it, tough floppies. Is there such a word as user-unfriendly?

ASYLUM

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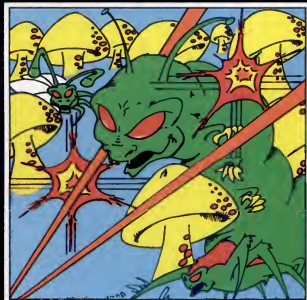
Requires: 48K, one disk drive

Age-group: 12 to adult

Number of Players: One

When Microsoft's Adventure was the hottest game on the market for the PC, this reviewer's tireless assistants, 8-year-old Miranda and 11-year-old Sadie, couldn't be pried off the keyboard. Now they have a new challenge, Asylum, a similar adventure game in which the players' goal is to escape from a mental hospital. Using typed commands and the PC arrow keys to move about, players must dodge every-

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thing from guards to crazed ax murderers to make good their escape.

Asylum has a beat-the-clock element that adds thrills to what is essentially a game of memorizing the proper commands in order to overcome the various obstacles. Ostensibly, players have from 9:30 p.m. to 5:30 a.m. to escape from the asylum before the day shift returns. A digital clock on the screen marks time; each minute is equal to about 30 seconds of real time (in other words, the game lasts 4 hours).

Use of Graphics

Asylum's use of graphics is one of the features that makes it more exciting than *Adventure*. Although the game's human forms are somewhat stick-figured, they are nonetheless serviceable and a welcome addition. The game's best graphic effect is triggered when a player curses the game three times. After expletives of the player's choice, the screen dissolves into a shimmering wall of "!!@#%*!s."

The graphics lend themselves to some funny error messages. When players throw a grenade at a door that they're supposed to unlock with a hidden key, the room flickers, flashes, and then explodes.

Ease of Use

Asylum uses an above-average vocabulary. It can comprehend commands such as "give cigarettes to inmate" that would have left *Adventure* muttering "I don't understand." Best of all, players need only press the F2 key to get a complete list of words understood by the program. (Players can also get a print-out of the vocabulary.)

Asylum loads automatically and has an elaborate, Cecil B. DeMille-style opening sequence, complete with credits for the programmers.

The game also has a Suspend Game feature "added for those who will be trying to escape from Asylum during work hours." Players press F9 when the boss walks in, and the screen temporarily clears.

Accuracy and Error Handling

To this reviewer, the asylum looked more like a haunted house, but who's to say what your top-of-the-line video looney bin looks like anyway. The program does a good job of telling players when it doesn't understand something. If "get the ciga-



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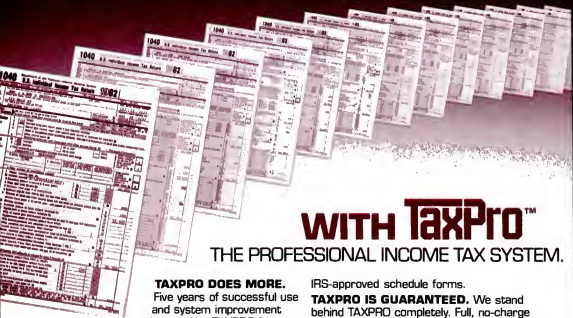
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rette" is an unprogrammed command, the program responds, "I don't understand."

General Appeal

Although Sadie found the game "cool," this reviewer had a few reservations. One problem with *Asylum* is that it can't be copied, although the manufacturer does provide one backup disk for \$3. Defective disks are replaced at no cost within 30 days of purchase; however, the address of the company does not appear on the disk or in the explanatory booklet. Odds are that if a player needed a replacement disk, he or she would have to go through a considerable hassle to find out where to send the old one.

One last nontechnical criticism: If the

reader knows anyone who has spent time in a mental hospital, *Asylum's* snakepit view of psychiatric illness and treatment might appear somewhat less than enlightened, not to mention in poor taste. When compared to the nuke-the-world mentality of many arcade games, however, this objection might seem trivial. /PC

Lindsay von Gelder is a New York-based free-lance writer whose work has appeared in numerous newspapers and magazines including *New York*, *Rolling Stone*, and *Redbook*. For a look at the creation of game programs and Omegahug in particular, see "Modus Operandi: How to Write a Computer Game" in this issue.

GAMES/DOUGLAS COBB

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FILE NAME: **FILEDEF** FILE: **FILEDEF** 04-12-1982

FUNCTION: **File Definition**
Record Size: 120 Record Records Per Disk: 1200

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

FILE DEFINITION

FILE NAME: **FASTSEL** FILE: **FASTSEL** 04-12-1982

FUNCTION: **Fast Selection**
No. of active records: 0

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

FAST SELECTION

FILE NAME: **CUSTOM** FILE: **CUSTOM** 04-12-1982

FUNCTION: **Custom Mailing Labels**

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

CUSTOM MAILING LABELS

FILE NAME: **FASTSORT** FILE: **FASTSORT** 04-12-1982

FUNCTION: **Fast Sort**
No. of active records: 0

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

FAST SORT

FILE NAME: **FILEMAINT** FILE: **FILEMAINT** 04-12-1982

FUNCTION: **File Maintenance**

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

FILE MAINTENANCE

FILE NAME: **SYSTEM** FILE: **SYSTEM** 04-12-1982

FUNCTION: **System Menu**

Field	Field Name	Field Length	Field Type
1	NAME	30	1
2	ADDRESS 1	30	1
3	ADDRESS 2	30	1
4	CITY	20	1
5	STATE	10	1
6	ZIP CODE	10	1
7	TELEPHONE	15	1
8	DATE	10	1
9	DATE TO DATE	10	1
10	NAME	30	1
11	ADDRESS 1	30	1
12	ADDRESS 2	30	1
13	CITY	20	1
14	STATE	10	1
15	ZIP CODE	10	1

Field Name Field Length Field Type

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decathlete. If a player's score surpasses Jenner's or the Swede's best overall mark, that player has the option of taking the "write protect" tab off the game disk and recording his or her own point totals for each event. Those totals are then displayed the next time the game is played, giving all competitors a new goal.

Ease of Use

Decathlon is simple to operate. Only making a backup copy of the disk require reading the manual. The software is user-friendly and self-explanatory.

The game is packaged in a hardbound folder with a pocket for the disk. Documentation is helpful and accurate: with the aid of diagrams users can easily learn how to play Decathlon. Accurate keyboard operation instructions and clear explanations of each event are given. The game matches the documentation well. The scoring tables in Decathlon are similar to those used in actual competition.

Each event played on the PC visually simulates the real-life running, jumping, or throwing of that event. The program introduction and conclusion are equally well produced. The accompanying sound effects augment the lifelike graphics.

EACH PLAYER'S goal is to win the gold medal and stand under the flag on the victory platform.

General Appeal

Microsoft's approach keeps the game interesting. First players are allowed practice sessions to brush up on the events; then up to six players compete against the recorded scores of others. Each player's goal is to win the gold medal and stand under the flag on the victory platform. The program actually depicts the moment of glory.

Error Handling

When an unacceptable entry is made, the computer beeps to prompt the player into reentering the command. Most unac-

ceptable keypresses are ignored when the program is anticipating a particular response. If the prompt is "Press the escape key to continue," for example, only the escape and control break keys are activated.

One error is mishandled by the program, however. If the game disk is removed from the disk drive during play, the disk drive tries to reacquire the program. The program does not catch this error, so the disk drive keeps spinning until the computer is turned off or the disk is reinserted. The disk drive could be damaged if left in that state for long.

Warranty Support

Decathlon is guaranteed to be free of program errors. It is sold and supported by IBM PC dealers, who are obligated to replace the program disk if defects in workmanship or materials are discovered within 90 days of the date of purchase.

A Gold Medal Game

After competing in the decathlon at the national level for 4 years, I was eager to evaluate Microsoft's Decathlon. Personal knowledge of decathlon training and strategy make a critic particularly aware of the

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product's content. This impressive, realistic game brings back vivid memories and provides exciting entertainment through all ten events. The jumping and throwing events are particularly authentic, applying theories used in actual competition. Strategies combining speed, timing, and direction are authentic enough to help an Olympic hopeful train on the basic principles behind the individual events. *Decathlon* can be played for months and still be exciting.

SLYNX and VIPER

Ivy Research, Inc.

P.O. Box 88 Yale Station

New Haven, CT 06520

(203) 432-3004

List Price: Slynx \$34.95; Viper \$29.95

Requires: 64K, 80-column monitor, one disk drive

Age-group: 8 to adult

Number of Players: One

Slynx and Viper are arcade-type games for the PC. Although the games are played differently, their overall format, packaging, and instructions are similar.

Slynx

The game's namesake and primary villain is a rapacious snake—the slynx—whose head and tail switch places with mythological ease. The exchange can occur when a player presses the arrow key opposite the direction the slynx is heading. The head and tail can also flip-flop when the slynx's head bounces off an object such as a wall or even off itself. This startling power of mutation makes Slynx a game of skill and strategy that can be played at several levels of difficulty, depending on the player's proficiency. The speed of the slynx, for example, is chosen by the player.

The object of the game is to score as many points as possible. To do so, players must direct the slynx to numerically valued parcels of food randomly placed on

the playing field. After the slynx eats the food, points are awarded, based on a multiplication factor determined by the player's skill level and by the value of the food.

Players can also score points by directing the slynx to eat musical notes in a kind of voracious opera in reverse. The notes, also randomly placed on the screen, appear at fixed intervals. The longer the notes are on the screen, the faster their values decrease until they finally disappear. If the slynx can get to the notes in time, a player receives bonus points equal to the sum of the value of notes consumed.

The highlight of the game is the growing length of the slynx's body every time it catches food. The more food it eats, the more the screen brims with crisscrossing coils of slynx. The irony of this mad gorging is that to get more food, players must maneuver the leviathan snake through a maze of its own body.

Players can alter the action of the game by selecting options from a menu displayed before the game begins. The slynx can bounce off of walls, itself, or nothing at all. The latter option is especially challenging because of the risk: if the slynx bumps into an object, and the game ends.

There are three versions of Slynx: Demo, Solo, and Duo. Demo stands for demonstration, a version of the game played only by the computer, showing players the basics of the game. Solo, as the name implies, is played by one user. Duo pits the player against the computer. Duo has the added attraction of two slynx snakes simultaneously competing for the food; one slynx is controlled by the computer, and the other is controlled by the player. With the no-bounce option, all the games end at the request of the user or with the death of the slynx.

Viper

Unlike Slynx, Viper is a game in which one player tries to capture gold points while being chased by the deadly viper. Although points are accumulated the same way as in Slynx and both use arrow keys, Viper players can control the game with a joystick. Viper is actually two games in one: Progressive Viper and Roco Viper.

In Progressive Viper the player tries to avoid the snake while scoring as many gold points as possible. Gold points appear randomly on the playing field, as does a

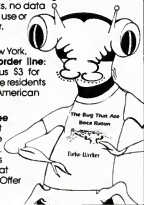
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OASIS-16	Yes	—	?
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B* Hard Disk System	Up to 40 Mbytes	—	?
Lace Cartridge System	Yes	—	?

¹For comparison purposes, typical professional configurations consist of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232 Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent.

²Columbia Data Products also supports CP/M 80[®] with an optionally available Z-80 CP/M Expansion Board.

³As advertised in BYTE Magazine, August 1982.

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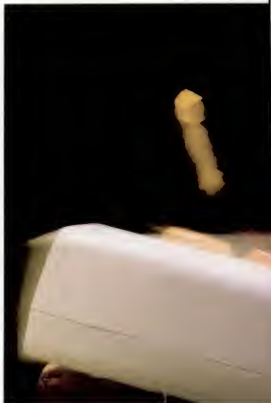
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passageway leading to a sanctuary where they can be stored. The stored points are then added to a player's running total. The viper is also allowed to make its own insidious progress. The more points a player gathers, the more skillful the viper becomes, making it increasingly difficult to capture additional gold points.

Race Viper is a race against time. Players try to accumulate 100 gold points as fast as possible. When point 100 is captured, the passageway to the sanctuary opens; the clock stops when a player enters. Players compete for the best time.

Each Viper game features five phases individually designed to challenge the skills of the player. The method by which points are awarded and the size or shape of the playing field will change according to the level the player chooses.

In Slynx and Viper players can keep track of their performances by using Save Score, a device that records and displays the ten highest scores.

Ease of Use

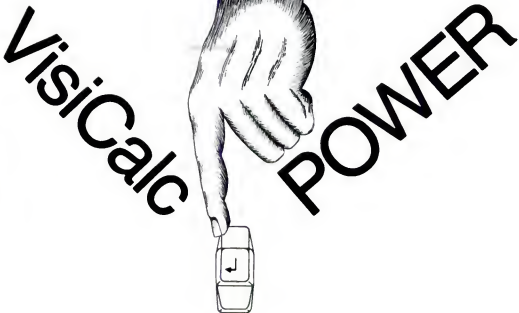
Users are required to read the documentation before playing Slynx or Viper. Players must boot PC-DOS and type in the name of the program. Without documentation, users must list the directory of the disk to find out program names. The games' menus are self-explanatory. Once a program is running, additional playing instructions are provided.

A major problem with these games is that the user has to add DOS to make them what the manual describes as "self-booting." If a player simply adds DOS and boots the disks, a "Bad Command File" error will appear. To make the file work, a COMMAND.COM must be added, a procedure not mentioned in either of the instruction manuals. Although the manufacturer describes Slynx and Viper as self-booting, they clearly are not. They would be much easier to use if they were.

Documentation and Packaging

Each Slynx and Viper package consists of an instruction manual, one disk, and a survey form. The packages come in plain plastic wrappers, and the manuals look as though they were published on a petty cash budget (the pages appear to be photocopies).

Although the manual's appearance is on the sunny side of cheap, the instruc-



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tions are clear, concise, and thorough. The only deficiency of the manual is the absence of diagrams to show novices how to operate the PC.

Use of Graphics

The games do not incorporate color graphics; the standard character set is used instead. The lack of visual pizzazz is disappointing because color graphics can do so much to heighten the appearance.

General Appeal

At first neither *Slynx* nor *Viper* is very interesting, but continuous play sharpens skills and prompts a more careful examination of the games' finer points. Because of this perseverance and the various skill-testing options on the menus, diligent players can expect their interest to be held.

Accuracy

Overall, the games are accurate and seem to match all the documented specifications. Other than a few bugs in the menu displays and the problems encountered with adding DOS, there are no discrepancies between the documentation and the programs.

Error Handling

These games are very forgiving of operator error. If the player strikes the wrong key, the program beeps and continues on its sly way. The errors that matter are game errors—the player is not forgiven for getting caught by the *Viper*.

Warranty Support

Ivy Research prints its mailing address and telephone number throughout the manual, and a customer survey/questionnaire is included, which makes it appear as though the manufacturer really cares about its products. When I called Ivy Research's hot-line number about the problem with PC-DOS insertion, however, the call was taken by an answering machine. It seems that initial confidence in the warranty may have been unfounded—the call was never returned.

Unless the arcade addict persona lurks within a player, *Slynx* and *Viper* warrant only lukewarm reactions. Lack of color and poor use of graphics severely handicap the appeal of both. Ivy Research could have enhanced each game with a self-

hooting program, richer game selection menus, and more complete instruction manuals. The overall concept of the games is good and the ideas supporting them are clever. Habitual arcade game players should find them challenging and interesting.

FACT TRACK

Science Research Associates
IBM PC Sales and Service
P.O. Box 1328-C
Boca Raton, FL 33432
List Price: \$90

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one disk drive

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Number of Players: One

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Fact Track knows the answers to 390 arithmetic equations. The program can drill a student on one operation, such as addition, or on combinations of addition, subtraction, multiplication, and division. It randomly chooses problems for each operation. As the student sets shorter time

against a time goal represented by a rocket blasting across the screen.

Fact Track also offers an automated version of old-fashioned flash cards. The PC can flash problems more quickly than any teacher, even one who used to be a dealer in Vegas. Rather than show the correct answer and score after each problem, this approach displays a series of equations while the student writes the answers on paper. Equations can flash at about one per second, a rate that keeps pencils flying. When the exercise is complete, all the equations and their solutions are displayed.

More difficult problems, such as $20 + 30$ instead of $2 + 3$, are in a section entitled "Extensions." Even in "Extensions" the figures are never more than two digits, but play can be kept challenging by being sped up. The student who has mastered *Fact Track* can remember the right answers to all 390 equations almost instantaneously.

Ease of Use

An experienced user will probably have to help initialize the program disk with IBM DOS, unless the student is quite familiar with the PC. The documentation clearly describes this process, although it lacks any diagrams that might aid the novice with initialization, booting, and disk manipulation.

A problem could occur if the PC has both a monochrome display and a color monitor. The program cannot switch from monochrome to color during the booting process. The monochrome display and board must be manually removed for the program to be run properly. Other programs can switch from one display to another, and *Fact Track's* inability to do so could be a drawback.

The documentation shows that a series of exercise menus is displayed in the program, leading one to believe that they appear on different screen displays. All menus appear on the same screen, however, which might cause a little initial confusion. Once that is understood, the exercises in the program are easy to operate.

If the student chooses to return to the beginning of the program at the conclusion of an exercise, the introductory graphics are rerun. This may be a little tedious, however.

Fact Track is handsomely packaged in

***THE PC CAN
flash problems more
quickly than any
teacher, even one who
used to be a dealer
in Vegas.***

goals, the problems flash progressively faster.

Success can be measured in correct answers and speed of performance. After a student gives an answer, *Fact Track* displays the correct solution and provides a rundown on the student's score. Once players have mastered the mysteries of multiplication and are able to answer problems correctly, they can compete against their own best times or against their friends' times. They can also race

a hardbound folder with a pocket for the disk. The documentation is easy to follow.

ONE TO SIX competitors can gather around the PC to contend for the gold medal.

Accuracy

Foct Trock follows its specifications to the letter. There are no flaws in the equations, the program flow, the student timing system, or the recording of correct and incorrect answers. This is one educational product that won't confuse users.

This program is an example of perfect error handling. There is no way to crash the system. It simply ignores inappropriate

answers to a prompt.

General Appeal

The program's graphics are well executed. Each problem is displayed in large block letters in the center of the screen. When the student solves the problem, "GOOD" or "WRONG" is displayed below the answer.

The program is cleverly designed and is interesting to operate. While it's most helpful for beginners, advanced students can also brush up on some skills.

Warranty Support

Foct Trock is sold and supported through IBM PC dealers, who are obligated to replace the program disks if any defects in workmanship or materials are found within 90 days of purchase. The documentation does not list a hot-line phone number however, so a quick solution to an immediate problem would have to come from the PC dealer, whose support in this area is not necessarily guaranteed.

At Home or in School

The program is highly useful for drilling students in basic arithmetic while keeping their attention and interest. The student has the option at the beginning of the program to turn the sound on or off. This could be helpful in a classroom.

EVEN MOM and Dad have fun challenging each other's math skills.

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Douglas Q. Cobb is an educational analyst/programmer for DesignWare, Inc., a courseware development company based in San Francisco.

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Requires: 64K, one disk drive

Age-group: 16 to adult

Number of Players: One (but keeps
records for 14)

Very few computer games teach something useful to players. Reaction-time games such as Microsoft's *Decathlon* and *PacMan* are great for developing hand-eye coordination, but they have no real content. Adventure games are fun and full of interesting content, but they are built on fantasy themes that have little relevance to real life. At best, one's memory skills and mapmaking abilities improve. An exception to this pattern in computer games is *Millionaire*, which is a fun, complex game and a real education in the art of playing the stock market.

The object of the game is to become a millionaire in the stock market. At first this is done solely through investments, but as the player's fortune builds, options expand. After showing a minimal profit of \$2,000, the player is allowed to buy on margin. Even more flexibility comes later in the game.

A game of *Millionaire*, which takes about 2 hours, is played a "week" at a time over the course of 77 weeks. During

each week, the player can choose to buy or sell from among 15 stocks or to do nothing. Buy and sell decisions need not be made blindly: plenty of information is provided to help investors make informed decisions.

This is the same kind of information used by real-life investors: charts of overall market activity over an extended period of time; charts of the performance of selected industry segments; tables showing highs, lows, and the most recent price for each stock; and the news. During each game's first week of trading, overall market trends for the preceding 14 weeks are displayed. A single-industry segment is evaluated, and a summary of relevant news is offered along with the price of each stock.

This information is updated for each subsequent week as the computer moves

through the stock market scenario it has created. It also keeps track of the player's holdings and performance, raising status when certain income goals are achieved. It takes the computer about 6 minutes (the program claims 5) to work out the 91 weeks charted in each game. Records can be kept for up to 14 different players, although only one can play at a time.

Ease of Use

Although *Millionaire* is an easy game to play, it could be easier. The game does its own calculations, but it takes no advantage of the IBM PC's function keys and seems to ask for information in the wrong order. None of this seems necessary. The F1 key is just as good a way to start a buy transaction as writing out buy (or "bu," the minimal command specification)—it's also easier.



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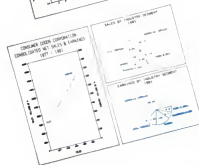
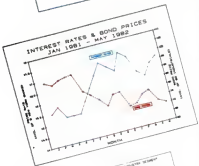
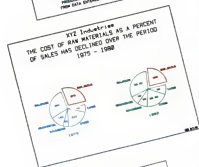
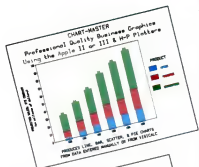
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The way in which the game orders information requests during transactions is frustrating. It seems logical to enter the name of the company to be bought or sold immediately after initiating a buy or sell action. The game demands, however, that the type of buy or sell transaction be specified before the company name is given. It's an unnatural order that takes some adjustment on the part of the user.

The Millionaire program could do more; its simple charts and graphs, for example, are the extent of its graphics, but they are well done. All in all, the program's limitations aren't really all that important. The game is easy to play, and although reading the manual is certainly useful, it isn't really necessary. Most users should be able to start up *Millionaire* and play it without ever looking at the manual. It seems to contain most of the information it should, even though it isn't well written. [According to the manufacturers, however, the manual has been revised and the packaging improved.]

Inside the simulation, *Millionaire* works in just about the same way as the stock market. News affects play, and there are patterns to be found and mastered. If the investor is good, a quick buck can be made with a quick buy and sell. But watch out—sometimes the market anticipates news and sometimes it ignores it.

Error Handling and Warranty Support

Unlike the actual stock market, this game won't kill the player's input if it is

General Appeal

An excellent simulation of the real thing, *Millionaire* will be enjoyable to people who play the stock market. A year's trading can be viewed in just a few hours. People who have contemplated playing the market should take advantage of some of the lessons to be learned in the game. Losing in simulation is better than with real money.

SAUCER/PAINTER/PALETTE

Micro-G

P.O. Box 102

Duluth, GA 30136

List Price: \$29.95

Requires: 48K, color monitor, one disk drive

Age-group: 7 to adult

Number of Players: One

Saucer is a game; *Painter* is two programs that turn an IBM PC screen into a painter's canvas; *Palette* is a program that displays the colors and backgrounds of the color-board-equipped IBM PC. Together the four programs comprise *Saucer/Pointer/Palette*.

The programs are an integrated set of tools. As a game, *Saucer* is only moderately interesting. Although it might entertain 7- to 10-year-olds for a few hours, it's not likely to hold the interest of anyone older for more than a game or two. Its biggest problem is that it is unfinished. The game has no clear end, no documented way of leaving the program (short of aborting execution with Ctrl Break), and no established reward for winning.

Use of Graphics

Looking at *Saucer* as a game, however, ignores its purpose. The game is better thought of as a test track to demonstrate the kind of graphics that can be built in *Painter I* (medium-resolution color) and *Painter II* (high-resolution black and white) and to allow testing of shapes built in the two programs. A creative artist can turn *Saucer*'s missiles into cannonballs, airplanes, or blobs of jelly. (A creative programmer might turn *Saucer* into a real game.)

Palette's purpose is similar to that of *Saucer*, although its potential is more limited. Pick any background. Pick any range of colors. *Palette* shows you what they look like together. It displays 16 col-

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entered incorrectly. If the wrong keystroke is made, the machine beeps and sometimes offers help. As in the real market, however, there are few guarantees. If the program disk is defective upon purchase, the user has 30 days to return it for a free replacement. After that replacement, disks cost \$10.

ors, including the background, and it does nothing else.

The core of the Soucer/Pointer/Palette combination is the two painter programs. Pick backgrounds, select foreground colors, and paint in a range of decorator colors using narrow and broad brushstrokes with Pointer I. Pointer II creates sounds and draws in black, white, and gray. Both allow the user to fill in shapes with pure colors and save the artistic creations to disk.

Ease of Use

Soucer/Pointer/Palette is a simple program to use. Most users will be able to master the set with only minimal reference to the documentation. Documentation, punched for insertion into one of the IBM PC manuals, is adequate, and packaging is minimal.

Most missed in the program set is a screen dump program that would permit hard copy of drawings made in Pointer II to be produced on Epson printers, and hard copy of Pointer I drawings to be made on color printers such as the IDS Prism. The addition of a screen dump feature would allow a broad range of hard copy artistry to be done in the Pointer programs.

P***PICK ANY background. Pick any range of colors. Palette shows you what they look like together.***

Overall, the program is simple, but sloppy. Some things that appear to be errors aren't, so the player is often unsure if something was right or wrong. Because the program is written in BASIC, error handling is easy when it truly occurs.

Soucer/Pointer/Palette comes with a 90-day warranty on the diskette, although the manufacturer says it will usually stretch that time limit. A refund (less \$2 postage and handling) will be given to those who return the package within 2 weeks. As it stands, the most satisfied customers will be those who are interested in

building screen graphics for games and "slide shows."

TEMPLE OF APSHAI

Epyx Computer Games/Automated Simulations

1043 Kiel Ct.
Sunnyvale, CA 94086
(408) 745-0700

List Price: \$39.95

Requires: 64K, color/graphics adapter, one disk drive

Age-group: 12 to adult

Number of Players: One (but fun for group play)

Temple of Apschai is a Dunjonquest, a medieval search and battle game in the tradition of Dungeons and Dragons. It is one of many Dunjonquests and other computer games that have been produced by Epyx Computer Games/Automated Simulations for Apple, TRS-80, and Atari computers, many of which will probably find their way onto the IBM PC over the next few years. The manual was obviously written for these other machines.

Ease of Use

Temple of Apschai is a complex game that is sure to hold surprises and difficult challenges for a long time. But it is an easy game to play. At level one the game appears uncomplicated. As the player gains experience and moves into the depths of the temple, however, things become increasingly complicated. The player learns the value of not killing a spider from underneath (spiders fall) and other complexities of exploration and survival. The IBM version of Temple of Apschai takes full advantage of the PC's function keys. This is not obvious from reading the manual, however, which shows the command structure used on another computer. The IBM commands are included on a quick-reference card, but it will not be immediately obvious to many first-time users that the commands shown on this card differ from those in the book. One must look for the difference.

Getting started requires a thoughtful reading of the manual, and actual play is considerably enhanced when the player uses the manual as a reference guide, looking up descriptions of rooms, opponents, and treasures. The descriptions are excellent, as is the fictional introduction to

the game, "The Adventures of Brian Hammerhand."

The manual is good, but it does not explain everything that a player might want to know. A great deal is left for the user to discover on his or her own, and it wouldn't hurt to take notes.

Although progress through the Temple of Apschai is graphically depicted on the screen and is described reasonably well in the book, some strategies of exploration and battle will work better than others. Notes on strategy and mapping of treasures and secret doors will be of inestimable value in returns to the inn and new explorations of the temple. The manual is

T***HE BOW shoots arrows and the sword thrusts.***

not written in an IBM version, however, so it can be somewhat confusing.

Use of Graphics

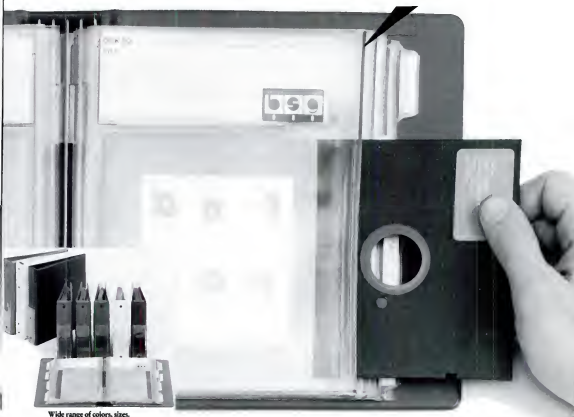
If the user doesn't want to take notes or refer to the manual, or likes the idea of relying on memory, the game's sounds and graphics will provide powerful pegs on which to hang remembrances. One can safely rely on the picture on the screen and memory for most things. The many rooms and monsters vary enough in shape to be distinguishable. Where rooms seem similar, other descriptive information is given.

The depiction of the temple itself is simple. Walls never curve or twist and details of the landscape are left out. Everything is predicated on straight lines. The character and monster graphics are good, though. The bow shoots arrows and the sword thrusts: both are shown on the screen.

The sound effects are also effective—a good thing since the pace of play in Temple of Apschai can be a bit slow. The slow pace works to the advantage of the game, but it can put the player off guard.

Some players object to the substitution of graphics for description in role-playing simulation games such as this one. Those people probably won't like Temple of Apschai.

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The graphics don't really test the capabilities of the IBM PC. A *Dunjonquest* that took advantage of some of the extended memory capabilities of the PC would offer better animation and more varied scenes. Still, the graphics look good on both color and non-IBM monochrome displays [Temple of Apshoi requires an IBM color board].

General Appeal

The goal of Temple of Apshoi is to survive the monsters of the temple and become rich off the treasures found there. One amasses weapons, magic, and treasure, all of which can be found in the temple. The game operates in real time, and it will not automatically give the player time to decide on the best attack strategy, look up a room, monster, or treasure in the manual, or take notes. Time can be created, however, through the use of the Treasure key (F6), which halts execution briefly while the user decides whether to grab or drop treasure. The command reference card documents two choices: G for grab

and D for drop. A third option is N for none.

The documented and undocumented features of the game are numerous, and the PC user who becomes a Temple of Apshoi player is likely to become a *Dunjonquest* addict. The game will be difficult and probably frustrating for elementary school children, although the graphics will be attractive to them. The best audience is teenager to adult.

Accuracy and Error Handling

Temple of Apshoi's somewhat slow play means that the complete exploration of any of the temple's four levels takes some time. Fortunately, Epyx/Automated Simulations has provided a chance for users to save the temple, as explored, for further exploration on another day. Characters can be saved on disk, along with their accumulated power and wealth, and moved from one *Dunjonquest* to another, when they become available for the IBM PC.

This saving can be done only during

the journey between the temple and the inn, but there are two ways of getting there. The best method is to find the way out of the temple (assuring safekeeping of the treasure or power that has been amassed). A less desirable route is death. If the player exits the temple with Olia's Dwarf, he or she loses everything. If Benedic the Cleric brings the player out, the loss will be minimal.

This "saving" process was the only bug in the program: an intermittent problem with saving the temple sometimes made it impossible to return. This bug has apparently been corrected, however, and users who experience this problem can exchange their program disks for the corrected version.

Warranty Support

If users find their disk to be damaged upon purchase, the manufacturers will replace it for free if it is returned within 30 days. After that time a replacement disk costs \$5.

Adults and teenagers will find excite-

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ment and entertainment in the theme and action of this game. The sword and sorcery theme combined with graphics gives this program the air of a slow but much more challenging Pacman. It's certainly worth the silver to grab this game for the PC treasure chest.

UPPER REACHES OF APSHAI

Epyx Computer Games/Automated Simulations

1043 Kiel Ct.
Sunnyvale, CA 94086
(408) 745-0700

List Price: \$19.95

Requires: 64K, color/graphics adapter, one disk drive

Age-group: 8 to adult

Number of Players: One (but group play is fun)

Upper Reaches of Apshei is an expansion kit for Temple of Apshei. Possession of the \$39.95 Temple of Apshei is a prerequisite to making use of the \$19.95 Upper Reaches of Apshei. Temple of Apshei offers four sword and sorcery adventures in the ruins of the immense underground temple of a cult destroyed in an earthquake. Upper Reaches of Apshei adds four new adventures that assume that the great quest of the temple is done, its treasure pillaged, and its monsters defeated.

The adventurers who defeated the Temple of Apshei are gone, dead, or returned to far-off homes with newfound fortunes. The locals, according to the prologue, are talking about life getting back to normal. But what of the adventurous late-comer who is too late to find fame or fortune but is in need of money to pay for the passage home? In Upper Reaches of Apshei, work around the neighborhood holds the possibility of finding lost or forgotten treasures in the vegetable garden, in the magical home of Merlis the Mage, or in the basement of Ollas (the thieving dwarf).

Upper Reaches of Apshei reminds us that fame and fortune can sometimes be found in our own backyards; that settling down to a mundane existence doesn't mean giving up the pursuit of our dreams. Its appeal is broader than Temple of Apshei, and it attracts people who might not enjoy other adventures.

Level one, "The Innkeeper's Backyard," is a much better introduction to Dunjonquests than level one of Temple of

Apshei. The monsters are not quite as deadly (except for the killer tomatoes) and the maze should be negotiable by elementary school children, including some second- and third-graders.

Ease of Use

Upper Reaches of Apshei operates almost identically to Temple of Apshei. The documentation and packaging are similar also, and its graphics are of the same quality. Even the command structure is identical. The monsters and the care with which one has to move around the neighborhood are decidedly different, however. One faces field mice, garden snakes, giant pumpkins, rabid dogs, and other suburban dangers.

Should you kill Merlis's cats and risk having Merlis get angry with you, or should you try to sweet talk them into letting you pass unmolested? Can you make your way through Benedic's Monastery without disturbing the monks or their personal possessions? How do you kill a killer tomato? These are the questions of Upper Reaches of Apshei. Your answers will determine whether you will find the money you need to get home.

There is money to be made (and found), magic to be discovered, and adventure to be had doing odd jobs around town. One also finds flies, creeping crud, and a great deal of worthless garbage.

Upper Reaches of Apshei is better than

How DO YOU kill a killer tomato?

Temple of Apshei in some ways. This fantasy holds a great deal of reality: The monsters come out of real-life suburbia where tomato gardens kill budgets, dogs bite kids, garden snakes and field mice terrify mothers, pumpkins are the consummate symbol of Halloween horror, and little girls and boys find adventure in the backyard.

Accuracy and Error Handling

Since Upper Reaches of Apshei is really an expansion kit for Temple of Apshei, it performs in much the same way. Erroneous keystrokes are indicated and the game accurately and consistently delivers all it

promises.

Damaged disks are replaced free of charge by the manufacturer within 30 days of purchase. After that time, replacement disks cost \$5.

For owners and enjoyers of Temple of Apshei, Upper Reaches of Apshei will be just as much fun, if only to retrieve some of the stuff Ollas the Dwarf has stolen from them in past adventures.

POLYCUBE

Linear Aesthetic Systems
P.O. Box 23

West Cornwall, CT 06796
(203) 672-6360

List Price: \$26.95

Requires: 64K, color monitor, one disk drive

Age-group: 9 to adult

Number of Players: One

How many people have a Rubik's Cube sitting around the house gathering dust since they gave up on ever solving the beast? Plenty of hooks offer ways to solve the cube and hordes of sixth-graders can desecrate it in minutes, but thousands of others spend lonely nights twisting the faces of their cubes in frustration.

Nonetheless, the arrival of Polycube, an "ultimate cube" puzzle developed exclusively for the IBM PC by Linear Advanced Systems, is exciting. Polycube is a flexible graphic simulation of Rubik's Cube that allows the manipulation of any of seven levels of the cube on the color screen of the PC. The levels of simulation are identified by the number of cubes stretching across each edge of the cube. They range from 1x1x1 cube, for people who shouldn't be allowed to randomize cubes except for the entertainment of others, to a 7x7x7 cube that would challenge Rubik himself.

My excitement with Polycube started when I heard that the program promised an unscramble command that looked like the answer to the dreams of players whose cubes are hopelessly randomized. And with its seven levels, it promises new challenges once the original is figured out.

Ease of Use

The user should read the manual before getting started. Although it is only four pages, it is adequate for the program. Don't be surprised to discover that the best

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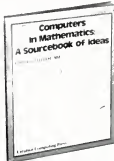
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thing about Polycube is its fascinating graphics. When displayed on a color monitor, Polycube becomes a thing of beauty. The color differences don't come across clearly enough on a black and white (or black and green) monitor. The display, however, is still effective in the absence of color.

A beautiful display does not necessarily lead to a program that will be of general interest. Such is the case with Polycube. Although its cover promises both scramble and unscramble modes, the unscramble mode is somewhat primitive, interesting only as a party entertainment or as a demonstration of the color graphics capability of the PC. It will not take a pattern and figure out a solution as some computerized cube simulations do. It simply reverses the moves that were made to scramble the cube.

Ease of Use

Polycube is easy to use. The commands are simple and functional and should be easy to master quickly. It is so uncomplicated that it is difficult to make an error in play.

If anything goes wrong with the disk within 90 days of purchase, the manufacturer will replace it. The warranty does not hold, however, if the disk is damaged by the user.

General Appeal

For people who don't understand the workings of cubes, Polycube will probably be very unsatisfying except as party entertainment. As the program randomizes cubes, it creates beautiful patterns. Because the program is written in accessible BASIC code, it should be easily modifiable to randomize a cube continuously.

Cube freaks will find the seven levels of Polycube fascinating, however, and might wear out parts of their keyboards attempting to solve the 5x5x5, 6x6x6, and 7x7x7 randomized cubes that the program can display. /PC

Davis Foulger is a New Canaan, Connecticut-based consultant who specializes in microcomputer and telecommunications applications. He publishes COMmodem, an on-line newsletter about microcomputations, electronic mail, and on-line information services that appears on CompuServe.

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List Price: \$29.95

Requires: 84K, 80-column monitor,
one disk drive

Age-group: 10 to adult

Number of Players: One

The game *Star Trek* was introduced in the early 1970s and quickly became popular. Since then it has been rewritten to run on almost every microcomputer. Omnic's *Space Guardian* is a good version of this game for the PC.

Space Guardian is played on a field representing the galaxy. The field is divided into 64 quadrants arranged in an 8x8 grid, with each quadrant further divided into 64 sectors. Each playing piece—including the player's starship, alien ships, stars, and star bases—occupies one sector. The object of the game is to travel around the galaxy in the starship looking for invading alien ships. The weapons are photon torpedoes and phasers. Every time the starship is moved, playing time is advanced. To win the player must obliterate all the aliens before time runs out.

The ten special function keys issue commands, and they are also used for navigation, weapons firing, shield control, damage reporting, and map displays. Also

THE COMPUTER
becomes the player's
alter ego.

included is a hyperspace drive, a sort of wild-card command whose results are unpredictable, as well as a command to set the level of difficulty and a resignation command.

One feature missing from *Space*

Guardion, as from earlier implementations of *Star Trek*, is computer assistance for navigation and torpedo aiming (the phasers target automatically). This missing feature, coupled with less than adequate abbreviations for the function keys, makes it difficult to play the game without consulting the manual.

The manual is typeset and has a flashy cover. The 22 pages are easy to digest, and a section on troubleshooting is included. The commands are clearly listed and explained, but no hints about approaches or strategy are included.

Space Guardian is played on an 80-column display. The game uses no line graphics but makes good use of characters. The screen is split into four areas—short-range scan, long-range scan, ship status, and a command-entry area—that are automati-

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From Nehring Associates \$35.00

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cally updated after each command. Torpedoes are tracked on the short-range scan, and the phasers are audibly fired. Although its graphics are not arcade level, the game is visually entertaining.

Spock Guerdion is about as accurate as *Star Trek*. Torpedoes must be aimed very carefully to hit their marks. Phasers always hit, but there is an accuracy problem: If the alien ship is very close, the condensed energy of the impact will result in the player being credited with a bigger hit than is deserved.

Error handling is excellent. Only valid entries are recognized, and only function keys can enter commands. If the wrong keys are struck, the computer responds with a beep.

There is no warranty for **Spock Guerdion**. The game is sold as is, and the disk is copy protected. A registration card is included in the manual, but it offers no protection to the purchaser and appears to have been included as a market research tool. No telephone number is listed.

Spock Guerdion is a strategy game rather than an action game and probably will appeal to older players. Children younger than 10 might be bored with the lack of action compared to video games. As a strategy game, however, **Spock Guerdion** will probably retain its appeal over time. It is one of the better versions of *Star Trek*, a game that, despite its many years on the market, is still enjoyable.

ZORK II, THE WIZARD OF FROBOZZ

Infocom

55 Wheeler St.
Cambridge, MA 02138
(617) 492-1031

List Price: \$39.95

Requires: 48K, one disk drive, [printer optional]

Age-group: 10 to adult

Number of Players: One (but a group will also have fun)

Adventure games are the pinnacle of text-only computer games. *Zork* is a microcomputer version of the original minicomputer game *Adventure*. *Zork II* is a new offering from Infocom, and it is truly a puzzler.

In this game, as in other adventure games, the computer becomes the player's alter ego. It takes commands and reports what is happening in the make-believe

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world of the adventure. The challenge in *Zork II* is to explore the cave world created by the game's author, figure out the puzzles by using the clues and tools scattered about, steal as much booty as possible, and escape from the cave. To further complicate matters, an added wizard appears from time to time to torment the player with obstacles.

Zork II is a sophisticated adventure game. It recognizes many high-level commands. If the player finds a table with several objects on it, for example, and enters the command "Take all," the game responds by picking up all of the objects on the table. It also tries—and fails—to take the table, telling the player, "Nice try!" or "No way." The game tries hard to decipher what the player wants to do and is therefore easy to use. But because part of the game is to try to guess the right commands, Infocom has not made the task too easy.

The manual for *Zork II* is a brief nine pages. It explains how to start the game, how to quit, how to talk to the computer, and how to save the player's position on disk so the game can be resumed at a later time. Also included is a list of some of the more useful commands the player might

include "Interesting concept" and "Nothing happens." There is nothing a player can enter that fazes *Zork II* in the least.

Infocom warranties the disk for 90 days. If the disk fails within that period, it will be replaced free of charge; after 90 days it costs \$15. A postage-paid registration card is included to activate the warranty. This system is less than perfect, however, because the disk is copy protected and eventually will fail, probably after the warranty expires.

Adventure games are highly appeal-

ing—people spend hundreds of hours trying to solve them. *Zork II* is especially fascinating because of its difficulty: Objects must be combined in complex ways to get anything done. That pesky wizard always pops up at the worst times to put a curse on the player. *Zork II*'s appeal is just short of universal; the game is attractive to everyone but younger children, who tend to get frustrated by it.

Zork II is a challenge. It is interesting, difficult, frustrating, and, most of all, enjoyable. For those who have plenty of time,

ZORK II IS a sophisticated adventure game.

not think of, such as "Inventory" to list the objects the player is carrying. The manual is vague about the specifics of *Zork II* because the real fun of an adventure game is figuring out how to play it. A quick-reference card of commands rounds out the documentation package.

Zork II employs no graphics; it is entirely a text game. At the top of the screen a status line tells the player's position, the current score, and how many moves have been made. Beyond that, the game might as well be played on a teletypewriter.

The game tallies all positive and negative point scores accurately. It also keeps an accurate count of player moves for rating purposes. Errors are handled in a clever manner. If you press the Enter key with no command, the game responds with "Beg pardon?" Other responses to errors

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CHAMPIONSHIP BLACKJACK

PC software

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San Diego, CA 92103

List Price: \$34.95

Requires: 64K, one disk drive

Age-group: 10 to adult

Number of Players: One to five (color);
one to six (monochrome)

Blackjack is the only gambling game in which the odds sometimes favor the player over the house. To win at blackjack, the player must use some kind of strategy. *Championship Blackjack* for the PC is much more than a computerized version of the card game—it teaches two strategies for winning. One is simple to learn but less effective; the other is more difficult but can make a player a big money winner.

In blackjack, the objective is to accumulate cards that total 21 or less and to have a higher total than the dealer. If the player's total is higher, the dealer pays \$1

for every \$1 the player bets. Blackjack (an ace and a face card or 10) pays 3 to 2. Leaving things to chance, the odds are against the player. If a few basic rules are followed, however, the odds swing in the player's favor. He or she can use a simple strategy based on the cards showing or a more complex strategy based on a running count of the cards dealt. In either case, *Championship Blackjack* offers practice for that big run on the casino.

The game is easy to use and can be played without referring to the manual. When the game starts, it asks whether the player wants to use the computer's color or monochrome screen. This is an important feature if both screens are present, since IBM has not supplied a good method of switching between screens outside BASIC. The color version accommodates up to five players and the monochrome allows up to six. The F9 function key is a help request and is displayed at the top of the screen. The player asks for a hit by typing H, stands by typing S, and doubles with D.

Championship Blackjack offers many options: The rules can be changed, tournaments played, and statistics displayed. All of these functions are fully described in the manual, which is typeset and includes sample screen configurations.

The graphics for this game are attractive. They are almost as interesting on the monochrome screen as they are in color. A special version of *Championship Blackjack* is available for systems with color display adapters connected to black and white monitors. When the cards are shuffled, instead of printing the message "Cards are shuffling," the computer displays the cards flipping across the screen accompanied by appropriate shuffling sounds. The cards are shown with both faces and backs.

Championship Blackjack not only adds up the cards and keeps track of winnings and losses, it keeps game statistics and can conveniently display them. The game also handles errors well. An incorrect entry does not register; if the wrong key is used, the game simply beeps in response, pa-

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tiently waiting for the player to stop fooling around and get down to business. A bet cannot be taken back either, just like in a real casino.

PCsoftware extends a 90-day disk warranty; during that time, a defective disk will be replaced free of charge. No post-warranty replacement policy is mentioned in the manual, nor is a phone number listed for customer service. A warranty card is enclosed to register the purchase.

Instead of providing just a game, PCsoftware has created a learning tool with a game built into it. Players can learn either the basic technique for estimating the odds or Julian Braun's point-counting system for odds calculation. Championship Blackjack accommodates both interests, as well as people who simply want to have fun. This game is a must for avid blackjack players. It is fun at parties and could pay for itself many times over at the casino tables. At the very least, it could prevent you from losing your shirt.

BRIDGE TUTOR

Comptrickx

533 Fifth St.

Santa Rosa, CA 95401

(707) 544-8363

List Price: \$60

Requires: 64K, color/graphics adapter,
one disk drive

Age-group: Adult

Number of Players: One

Bridge is one of the more difficult card games. Bridge Tutor is not really a computer game, but a programmed aid for learning bridge. Such a program has a good deal of potential for making a complex game easier to learn. Unfortunately, Bridge Tutor does not succeed in this task.

The program is completely menu driven, which should make it easy to use but does not. All menus are simply labeled "Menu"; at any given time, the player is unable to tell at what level Bridge Tutor is functioning. There are minor irritants throughout the program, including stilted English and spelling errors, such as "except" instead of "expect" and "substract" instead of "subtract."

An unwary student can easily move into deep water with an inappropriate menu selection and find the subject matter too complex to deal with. Apparently, the only way to remedy this situation is to

reset the computer. Incorrect answers to a question result in the question being asked over and over again.

The eight-page typewritten manual is printed on plain white paper, with hand-drawn lines highlighting key sections. Some errors in the documentation have been corrected by hand. The adequate instructions explain how to start Bridge Tutor and how to use the tutorial and quiz generator.

Although Bridge Tutor requires the use of the IBM color/graphics adapter, it is primarily text-oriented. An illustrated beginner's introduction to bridge includes simple graphics showing the playing table and how the cards are dealt. Except for this feature, however, the screen is used as a listing device for text.

This software package is strictly for the serious bridge student. It teaches the rules and bidding using the standard American approach. A quiz generator can be used to practice opening bids, the precision club system, and the scientific bidding system. Because Bridge Tutor does not actually play a game of bridge but lets the player practice certain aspects of the game, its appeal is limited to those who are interested in learning about the game or sharpening their bridge skills.

Bridge Tutor covers a wide range of material, from how to shuffle and deal to sophisticated bidding systems. Unfortunately, the more advanced sections are woefully inadequate and, in some cases, quite inaccurate. Computrickx would have done better to focus on presenting the fundamentals clearly and correctly.

Bridge Tutor handles errors fairly well, although it is possible, as noted earlier, to get locked into a seemingly endless loop if the player does not know enough about bridge to answer a question. Because there seems to be no option to terminate the troublesome program session, the player must either continue to guess at the right answer or reset the computer.

Bridge Tutor has no warranty or registration card. On the last page of the manual Computrickx absolves itself and its dealers of all responsibility for the product. Customer service is poor. The listed phone number is not for Computrickx, but for an organization that does not appear to know much about the product.

Bridge Tutor cannot be considered a computer game, but rather a learning and practice aid for bridge. Unfortunately, it

does not successfully serve this purpose. For the money, the program should provide the purchaser with much more.

GROUNDUP!

Direct.entertainment

695-C S. Broadway

Boulder, CO 80303

(303) 494-8265

List Price: \$29.95

Requires: 48K, color/graphics adapter,
one disk drive, (joystick optional)

Age-group: 6 to adult

Number of Players: One

At last a game for the PC that has real action! Because it is more difficult to write an action game for a computer, arcade-like games have been slow to appear. GroundUp! is one of the first.

The concept of the game is quite simple: The screen displays a house and trees with a person and a dog in the foreground and mountains in the background. Various aircraft fly overhead. In the lower right-hand corner of the screen is a pillbox with a gun emplacement. The object is to shoot down as many of the aircraft as possible before the bomber aircraft can hit the pillbox. The player is permitted to have as many as three shots in the air at one time. The artillery shells follow realistic trajectories and fall back to earth if they miss.

The disk can be taken from its box, directly loaded, and run. It is not necessary to place the PC-DOS or COMMAND.COM files on the disk as is required for most other games. When the game starts, it enters a display mode. Each aircraft flies onto the screen accompanied by its sound effect. The point value for the aircraft is printed while the message "Strike any key to begin" is displayed. If the player waits a few seconds, the game enters a demonstration mode and automatically fires at the overhead flyers.

GroundUp! is played using the 8 and 2 keys on the number pad for "up arrow" and "down arrow" respectively, with the Escape key serving as the firing button. This isn't obvious from the screen display and is incorrectly explained on the instruction sheet. A joystick plugged into a game adapter can also be used. The joystick controls the direction of the gun, and its button fires the gun.

GroundUp! is packaged in a hard vinyl cover that protects the disk and constitutes

part of the documentation. The single-page instruction sheet is about the size of a diskette and explains how to start the game, arm the gun, and shoot. The lone strategy hint is to shoot the bomber before it gets you. The scoring system is displayed on the screen. Although brief, the documentation is adequate.

Graphics are important in arcade-type games, and those used in GroundUp! are very effective. The high resolution of the PC's color/graphics adapter is put to good use—the expensive hardware proves well worth its price.

Accuracy seems to be the major flaw in this game. When a sufficient number of moving objects are on the screen, the shells slow down and frequently miss. Although this might be viewed as an extra challenge, it becomes irritating. Also, the gun sometimes fires but no shell appears. The game treats this situation as though a shell were on the screen for the purpose of enforcing the three-shot maximum volley but not for scoring purposes.

Error handling is excellent. Only the

AT LAST A game for the PC that has real action!

three keys used for the game are recognized, so you can't bomb the program with an incorrect entry.

Direct.entertainment does not warrant the software but will provide a replacement disk for \$5 if the original ceases to function.

Like most arcade games, GroundUp! has wide appeal. The three highest-scoring players' names and scores are stored on the disk and displayed after every game, so it is easy to get hooked for hours trying to beat these scores. For those who have been itching to play an action game other than IBM's Donkey, GroundUp! is the answer. It is a simple game to learn but difficult to master. It will provide many hours of entertainment. /PC

Steve Leibson is an electrical engineer who designs and writes about computers. He designs Computer-Aided-Design Workstations for the Codenetics Corporation in Boulder, Colorado.

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WORD-SCORE

NorFork Systems

8 N. Fork Rd.

Laurel Springs, NJ 08021

List Price: \$29.95

Requires: 64K, one disk drive, color graphics adapter, Advanced BASIC

Age-group: 6 to adult

Number of Players: One to four

If you have ever played *Hongmon* and enjoyed it, you will love *Word-Score*. It is an electronic version of *Hongmon* with a number of inspired variations, including one that just might liven up parties after the kiddies have gone to bed.

The game begins with a display of a well-drawn lynching platform, complete with gallows and a view of the jailhouse door. The bottom of the screen has the alphabet and a row of dashes—one for each letter in the word that the player must guess.

When a player enters a letter, it either replaces one of the dashes or a body part appears in the noose. The first letter guessed incorrectly draws an understandingly worried face. Each incorrect entry is followed in succession by a torso, legs, arms, and finally, a hat. Accompanying this macabre guesswork are strains from the second movement of Chopin's Piano Sonata #2, which every kid will recognize as the funeral march.

Each letter the player chooses also disappears from the alphabet listing. If the letter is entered a second time, the program gently admonishes, "Try Again."

Word-Score comes with four levels of vocabulary: "Basic" for grades 1-3, "Elementary" for grades 4-6, "Graduate" for junior and senior high school students, and "Scholar" for college level players.

Word-Score's most useful option is its

ability to accept as many as eight files of words that can be entered with the keyboard. Words from a student's spelling book, a technical dictionary, or a foreign language can be added to the files as a teaching device, or the player can invent

THE MACABRE guesswork is accompanied by strains of Chopin's "Funeral March."

an X-rated version—an ideal companion for "dirty-word" Scrabble enthusiasts.

Ease of Use and Documentation

The 12-page booklet provided with the game gives adequate instructions for formatting a disk and copying *BASICA* from PC-DOS and the *Word-Score* program onto a new disk. The program takes over at that point, flashing questions on the screen.

Each player can turn the sound on or off and has the choice of playing the game with its prechosen word list, entering new words, listing words, or updating word

files. *Word-Score* allows from one to four players to participate, each of whom may select a level of difficulty. This is a useful feature when the whole family plays.

Use of Graphics

Images on the screen will not generate frenzied excitement, but the graphics are functional. There is no provision for the generation of a monochrome version. The picture and text, however, can be read with relative ease on a single-color monitor driven by the IBM graphics adapter.

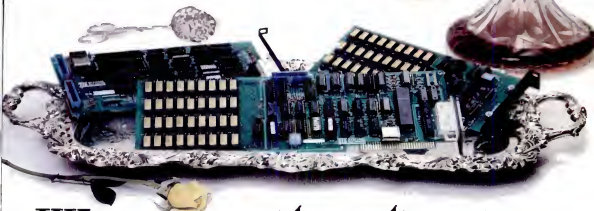
Players of all ages with an interest in improving verbal skills will find *Word-Score* a useful tool. The possibilities for educational use and challenging games are endless. The only limitation is that the words must be composed of only letters and between three and 12 letters in length.

Accuracy, Error Handling, and Support

When a random list was checked against a dictionary, every word was spelled correctly and each guess produced an appropriate response.

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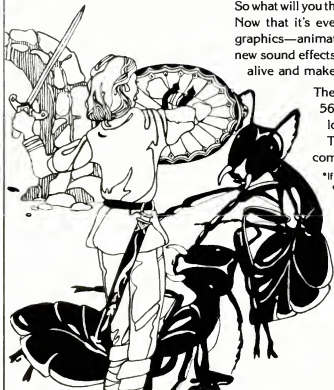
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accepted range for addition to the word list, the program will ask for reentry.

The program can be hung up by striking one of the IBM's function keys instead of a letter. The player need only strike Esc to get out of this bind.

Defective disks will be replaced free of charge within 90 days, upon return of the original disk to the manufacturer or any authorized dealer.

Word-Score is an outstanding program that is both educational and sufficiently entertaining to maintain player interest. It merges learning and playing to create an excellent educational atmosphere.

ADVENTURE (Microsoft)

IBM Systems Products Division

P.O. Box 1328

Boca Raton, FL 33432

List Price: \$30

Requires: 32K, one disk drive

Age-group: 2 to adult

Number of Players: One

Do you remember the original *Adventure* game? Well, now it is available for the PC. IBM's *Adventure* is the direct descendant of Colossal Cave, a game written 10 years ago in unwieldy FORTRAN on a ponderous, cranky mainframe at MIT.

Adventure is neither flashy nor pretentious, but it has affirmed its appeal through generations of players. The game is all words—no graphics or sound effects—but it has a fairly limited vocabulary. *Adventure* has become a classic because it does not try to overwhelm the player with bizarre effects, and it depends on a conservative, well-engineered formula to maintain player interest. It should be no surprise that *Adventure* is the only true game marketed by IBM for the PC.

The goal of *Adventure* is to enter Colossal Cave, explore its more than 130 rooms, and escape with as many of its 15 treasures as possible. Magic words and puzzles need to be solved and various props along the way figure in the game, including a bird with a very special talent, a ferocious but tameable bear, a lantern, a bottle, a set of keys, and natural resources. The player moves through the cave with directional commands such as north, south, up, down, and ascend and descend.

The program accepts two-word commands, such as "take keys," "light lamp,"

or "free bear." If a player gets stuck—beginners are almost certain to end up in a maze or a room that seems to have no exit—the program will display, "I am prepared to offer you a hint, but it will cost you points."

Points are accumulated by exploring the cave and by locating and transporting treasures back to the counting room. Points are lost by asking for help, quitting, accepting hints, or getting killed.

Certain situations require independent thinking, but nothing that would strain a child or an attentive adult. One of the important steps in the game involves crossing a chasm. The following display appears on the screen: "You are on one side of a large, deep chasm. A heavy white mist rising up from below obscures all views of the far side. A southwest path leads away from the chasm into a winding corridor. A rickety wooden bridge vanishes into the mist. A sign posted on the bridge reads, 'Stop! Pay Troll!' A burly troll stands by the bridge and insists that you throw him a treasure before you may cross."

The player will find that the troll is a tough customer. Throw him your lunch and he will eat it, but throw him a Ming dynasty vase and he might drop it. Try a little violence, such as throwing an ax, and the following is likely to appear: "The troll deftly catches the ax, examines it carefully, and tucks it back, declaring, 'Good workmanship, but it's not valuable enough.'"

Ease of Use

Adventure comes with its own disk operating system. The backup procedure is carefully explained in the manual. IBM has designed this program so that it will allow the making of only one backup version; the copying process changes a code on both the original and the copy to prevent further duplication. (The program verifies the backup version before it shuts the door.)

The IBM PC version of *Adventure* has a feature that holds a game in memory. This is a valuable feature if a player wants to stop before finishing the game. Reaching certain scoring levels in the cave may take hours.

Adventure works well on a monochrome monitor, although the lines of large and medium-resolution characters are too close for some players' vision. If a color monitor or television is attached to

the PC, the program allows the player to choose both the background color and the color of the letters.

Documentation and Packaging

The instruction booklet provided with the disk is an excellent example of the difference between documentation and a user manual. The 30-page booklet, complete with a color cover, is written in clear, nontechnical English. The manual also includes an offer for a series of hint sheets.

General Appeal

The reasons for *Adventure*'s popularity are as diverse as the players it attracts. *Adventure* cuts across age differences and appeals to both sexes. The game is much less violent than outer space shoot-em-ups except for some nastiness involving an ax and a fiendish dwarf. More importantly, *Adventure* forces the player to do some brainwork. The descendants of *Adventure*, such as *Deadline*, offer more substantial vocabularies and complex plots, but still remain distant cousins and do not challenge *Adventure*'s popularity.

Without buying a map or a book of

ADVENTURE
*cuts across age
differences and
appeals to both sexes.*

hints, a neophyte will need 6 to 8 hours of exploration to reveal some of the hidden treasures, much less carry them out of the cave. The player may get frustrated, but not bored.

Accuracy and Error Handling

The program's structure is practically bulletproof. It quickly rejects incorrect responses and words that are not in its dictionary. The backup procedure also works as advertised. One copy only, please.

One objection: Some of the words in the instruction manual are misspelled. The help message on the screen, for example, talks about "augery" instead of "augury," and "witts" instead of "wits." Is the IBM penchant for perfection slipping?

Warranty Support

As with most IBM products, service on Adventure is professional. The company guarantees the disk to be free of defects under normal use for 90 days. The program is sold through IBM Product Centers and authorized dealers.

Some games have better visuals; some beep and play amusing ditties; some even conduct conversations in complete sentences. But they all owe their allegiance, not to mention their electronic heritage, to Adventure. This hoary old classic should be included in any player's collection of games for the IBM PC. There is nothing quite like an old adventure.

WHIRLEE

Microrad Associates, Inc.

P.O. Box 1759

Kingston, NY 12401

(914) 338-3306

List Price: \$35

Requires: 64K, color/graphics adapter,
one disk drive, game adapter

Age-group: 8 to adult

Number of Players: One or two

Microrad, the creator of Whirlee, claims that any similarity between PacMan and Whirlee is coincidental. Whirlee gobbles up brown Photon dots, chews on green flashing Pulsars, and guess what else? Whirlee is being pursued during all this munching by a vicious pack of red Chasers, except after eating a Pulsar, when the Chasers become vulnerable for a few moments.

All this takes place within the confines of a maze to the accompaniment of frenetic music and occasional blasts of the "Charge!" trill.

The program includes a unique feature that should become part of every arcade-type game for the IBM PC. At the beginning of the game, the player is asked if a "joystick alignment" is necessary. "IBM did not specify a standard polarity for joysticks," according to Frank Naccarato, one of Whirlee's creators. "You could easily have joysticks respond backward to all your commands."

By selecting the alignment command in Whirlee, the player is able to tell the program which is top or bottom, left or right. The alignment need only be done once. If the joysticks are changed, the previous alignment values are stored on the

program disk.

DOS must be copied onto Whirlee's program disk for use on the PC. Users who have DOS 1.0 have to type two separate commands to start the program: Whirlee and BASICA Whirlee. The manual gives clear instructions to users of DOS 1.10 on how to set up an AUTOEXEC file that will allow the program to start by itself.

Use of Graphics

The graphics are nothing spectacular, but they serve the purpose. The center of the monitor's screen is taken up by a maze filled with brown dots. The green Pulsars are in the corners, while the red Chasers burst out of their holding pen in the middle when the game begins. The maze fills half the screen, leaving a border on all sides. This is a smaller display field than that offered by PacMan.

In the two-player version, both players simultaneously operate on the same screen; player B picks up the dots left over by player A, and their scores are tabulated separately.

Whirlee is shaped like a spinning three-quarter circle, cutting through the maze like a buzz saw. When Whirlee pauses to change direction, it looks suspiciously like PacMan, zipping around corners and gobbling up everything in sight.

The programming that controls the Chasers is rather sophisticated. Immediately after Whirlee eats a Pulsar, the Chasers change from red to green and run away. The effect wears off quickly, and the Chasers change color again and resume chasing Whirlee.

If the player makes a wrong move or chases a solitary dot across the screen, all four Chasers might pursue Whirlee at the same time. Two of the Chasers move at the same speed as Whirlee; one is faster and one is slower. Sometimes they split up and attack from different directions.

Whirlee has three lives, plus an extra life if any player gets over 10,000 points. The current score for each player and the top score recorded on the PC are displayed on the screen.

General Appeal

PacMan fever is contagious, and Whirlee resembles PacMan enough to attract a similar following of both children and adults. One of the reasons for Whirlee's appeal is the music, which contributes to the game's frenetic pace. Each session be-

gins with the "Call to the Track" theme and each game begins with a trumpeting of the cavalry "Charge!" The race through the maze is done to the accompaniment of the chase music from the "William Tell Overture."

The game annoyingly starts in the same position each time Whirlee is reincarnated.

WHIRLEE
resembles PacMan
enough to attract a
similar following
of both children
and adults.

ed after eating all the dots on the screen. The game would be more exciting if Whirlee's starting position were not quite so predictable.

Accuracy and Error Handling

The program works as advertised, awarding 10 points for each Photon, 50 points for a Pulsar, and between 200 and 1,600 points for each Chaser gobbled up during the "window of vulnerability." Bonus items range in value from 100 to 5,000 points. Usually the game is so fast-paced that the player has few chances to monitor the score.

The only keyboard input occurs during the setup, when the player can choose a one- or two-player game, turn the sound on or off, or request a joystick alignment. The program ignores all characters except the function keys.

The joystick alignment requires a careful, light touch because the wrong reading can be entered by allowing the joystick to move slightly when pushing the key. The alignment, however, can be changed easily if entered incorrectly.

If the game is not restarted by pressing Enter or one of the buttons on the joystick, the program reverts to what appears to be an ordinary DOS A prompt. Typing RUN results in an "Out of Memory" message. The program can be reloaded with the Ctrl Alt Del combination.

The program is also designed for a color monitor or color TV. The game is easier to follow if the player can tell when the

Chasers change color.

Playing *Whirlie* on a monochrome monitor driven by a color/graphics adapter may enable the player to get a better feeling for the game's tempo. Microrad says the program will automatically switch from a monochrome display card to the color/graphics adapter if both are present in the PC.

Warranty Support

The program comes with a 90-day warranty that promises to replace any defective disks. Microrad includes a card for customers to forward their comments on the game. Microrad also includes a full-page license agreement, spelling out the legal terms and conditions for using *Whirlie*. According to the manufacturer, the program is fully copy protected.

Whirling Right Along

Frank Naccarato of Microrad says *Whirlie* is the first of many products Microrad intends to market for the IBM. Some of the routines required for *Whirlie* can also be used in other arcade-type games, he says. Microrad will concentrate on products for the IBM PC because of the market penetration that the PC is expected to have. "We think it's going to become the premier machine," he says. "For those who already have a PC, a modest suggestion: Pick up a copy of *Whirlie* and the required joysticks and game adapter, and install a third slot just to the left of the disk drives; then paste on a little sticker that reads, '25 cents per play.' It's one way to pay for the machine."

METEOR MATH

Bratner Computer Support
P.O. Box 86634

San Diego, CA 92138

List Price: \$39.95

Requires: 64K, color/graphics adapter,
one disk drive

Age-group: Grades 1 through 6

Number of Players: One

In a recent cartoon a math teacher is standing at the front of a classroom pointing to a long division problem on the blackboard. Row after row of students are seated before *Space Invaders* video games, joysticks in hand.

"Okay, class," the teacher says, "shoot down the right answer."

Improbable, right? Well, Bratner Computer Support has done its best to make fact and fiction synonymous. *Meteor Math* is billed as an educational computer game that makes learning math tables fun. The game mixes the flashing lights, colors, and galactic cacophony of the video arcade with a measure of learning.

The object of the game is to destroy the meteors that fill the screen. The player pilots a spacecraft called "Radian Runner," armed with 50 long-range laser missiles. To launch the meteor-blasting lasers, the player must correctly answer math prob-

lems within 10 seconds of their appearance on the control panel. The meteor action on the screen, however, tends to overshadow the mathematical aspects of the game.

Use of Graphics

First the flash. The graphics and sound effects are first-rate, probably among the best produced for the IBM PC. After answering a few introductory questions (name, color or monochrome display, and sound or silent version), the player chooses a math skill for testing. Selections

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include addition, subtraction, multiplication, division, and a random mix of all four operations.

The screen clears after the player chooses a test skill and is redrawn as a view from the window of the Radian Runner. The ship goes into its take-off mode (with runway markings flashing into the window) and zooms into "hyperspace."

Directly in front of the player is the message display screen that gives readings of locations and indications of the fuel levels and missile supplies. Beneath the message screen is a picture of the Radian Runner and numbers 1 through 5.

A meteor appears opposite the number 5 and moves across to number 1, indicating that a player has 5 seconds to answer the question.

The number of meteors destroyed and lasers remaining is shown next to the message screen. The pilot's (player's) name also appears beneath the message screen and a fuel gauge is in the lower right-hand corner.

The left side of the screen has three information displays. One contains a quadrant number, which is of no particular importance because the player can get a reading on the progress of the game by looking at the number of missiles destroyed. The second display is a digital clock that counts the elapsed time from the beginning of the "mission."

The third display shows the real heart of the game—a small rectangle marked "calcs" that poses the mathematical problems. The math problem display is a major fault in the game design. It is difficult enough to find the math problem with fuel gauges, missile counts, and deadly meteors vying for the player's attention. This situation is further complicated by the position of the calcs display on the screen—off to the side, rather than in the center where it would be seen more easily. The emphasis on arcade effects and the location of the calcs display detract from the education potential of Meteor Moth.

Ease of Use

As an example of the problem-solving challenge, the calcs display might ask, "8*3=?" If the player types in the answer before a meteor reaches the ship, a laser beam arcs out and blasts the rock to smithereens. If the player waits too long, a "wingman" comes to the rescue, but no points are awarded. If the question is an-

swered incorrectly, the player gets a second chance, two incorrect answers and the screen display changes to show the windows of the ship covered by a "meteor screen." If the player can ignore the dazzling graphics for a moment, the correct answer appears briefly on the message board.

Each double-error reduces the player's fuel supply by one-fifth. After five such mistakes, the spaceship must be brought back to port. During the landing, the computer plays a complete refrain from

LESSONS should have equal billing with rockets and meteors.

"When Johnny Comes Marching Home."

The final display is of the "Mission Log." The player is told the number of meteors destroyed, the number taken out by the wingman, and the total elapsed time of the mission. If any errors are made, both the question and the correct answer are displayed. The log can also suggest in which of the four math skills the player needs more training. If the player wants a performance record, the screen displays an invitation for the player to press the PrtSc key for a copy of the log. The IBM PC command for printing the screen requires an upshift before the PrtSc key is pushed.

Documentation

For a product with such a fine on-screen appearance, the documentation suffers by comparison. The game has no simple explanation on screen or in the single sheet of instructions that comes with the package. The manual also has a problem with spelling. The instructions mention the "challenge" of the game, declare that IBM is a "registrd" trademark, and say that the program requires a color or "monochrome" monitor. Perhaps they should have a spelling game as well.

General Appeal

In addition to the fact that the flashy graphics and arcade sounds are distracting, and that the calcs display is located in the periphery, several other drawbacks limit Meteor Moth's value as an aid for

learning math.

One of the difficulties concerns the use of symbols. Division questions are posed using a slash symbol (/), as in $8/2=?$. Although computers use the slash instead of the traditional division symbol, not all students in grades 1 through 6 (the recommended age range for the program) will recognize or understand it. The program also asks $2*8=?$ for multiplication, instead of the standard $2x8=?$.

Another problem involves the display form for answers to division problems. The player is allotted up to four spaces for the answer, which is fine for $8/4=?$ but when the question is $8/7=?$ the answer and how to express it become more complicated. The program will not accept a fractional answer of $1\frac{1}{7}$, which is the way students are first taught division. Instead, the program insists on a decimal answer. So, $8/7$ (which is, for the record, $1.142857142857...$) is answered with 1.14. The answer to $5/3$ is 1.66, not $1\frac{2}{3}$.

In most elementary schools, decimal math is introduced in the fifth grade, but teachers usually do not insist on abandoning fractions at that point.

Accuracy and Error Handling

The program works as advertised, although it does respond slowly to entries—enough to frustrate younger players. On two of the many test runs given the game, the meteor shield rose several times without waiting for an incorrect answer. The sound can be shut off, thus reducing some of the distraction.

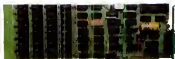
It was possible to hang up the program by entering letters instead of numbers, or by backspacing past prompts. The cure is to use the Escape key, although this is not mentioned on screen or in the documentation.

Warranty Support

Brauer offers a 30-day limited warranty for the program that "if properly installed, operated, and stored, will perform substantially in accordance with the documentation provided." No backup disk is provided in case of damage to the original.

Educational computer games necessitate graphics and special effects that complement the learning process. Lessons should have equal billing with rockets and meteors. Unfortunately, Meteor Moth is heavy on the graphics and light (or at least dim) on the learning. /PC

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California's Silicon Valley may reign as this country's most productive spawning ground of computer research and development. And tough, mostly young computer companies may feel compelled to scour the archipelagoes of the Pacific for cheap manufacturing sites in order to meet projected product demand. But without training grounds, the computer revolution would be mired in strategy sessions. In the cause of training the troops—or

what has come to be known as computer literacy—college and university campuses are converting to computer boot camps. No school has joined the crusade with more enthusiasm than Memphis State University in Tennessee, site of the recently opened Computer Literacy Lab.

In mid-1981 college computer courses more often than not either focused on programming or carried titles such as "Computers in Society." Neither approach was

satisfactory. The first was designed for up and coming specialists, apprentice macrowizards, and robot designers. The second appealed to anyone in need of extra credits for graduation. Classes offering hands-on experience were rare; at Memphis State they were nonexistent.

Like the microcomputer industry that created it, the problem of training users was new. It's still new, and solutions must be considered experimental. But after a

ALL SEASONS



year, our experiments at Memphis State exhibit many satisfying signs of success. We're well on the way in our pursuit of computer literacy—at least locally.

We knew where we wanted to go even if we weren't sure how to get there. The plan required a laboratory, computers to stock it, faculty, the blessing of the administration, and money. Bureaucracies, even benign and enlightened ones, prefer proposals to dreams. The dreamers at Mem-

phis State weren't prepared to write a proposal. Who, after all, was the course supposed to attract? Should there be prerequisites? How do you teach microcomputing? Guidelines were scarce.

Interested faculty members formed a committee and talked the plan over with local computer consultant Charles Brandon III. "Why not a course like this?" someone asked him, thrusting forth a syllabus. But Brandon had already come up

with a plan.

He sketched out a broad-based liberal arts approach that would introduce students to hardware, systems applications, organizational impact, and related societal issues. With his suggestions we wrote a concrete, comprehensive proposal.

Brandon agreed to join the University faculty for a year. For him it was a labor of love. He and an attorney friend, Frank Watson, raised \$135,000 from local indus-

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try to remodel and equip the laboratory and to support the course during its initial run. Most of the money came from the Federal Express Corporation, headquartered in Memphis. In addition to its philanthropic motives, this nationwide delivery service hoped to benefit from computer training for its employees. Several gifts came in anonymously. The Memphis-Plough Community Foundation, established by Abe Plough, the pharmaceutical magnate, volunteered to administer contributions.

The mad race to be operational by spring semester 1982 was on. We met with the dean and the president to solicit their support. Someone talked to the director of the Memphis State University Foundation to make sure there was no conflict between fundraising efforts. University attorneys drafted a contract with Memphis-Plough that would allow Memphis State to accept the gift of a laboratory. We discovered that universities think 12 times before accepting contributions of services and equipment.

WE *discovered that universities think 12 times before accepting contributions.*

Every decision was important and no details were trivial. The physical plant people had to approve the remodeling plans, and the plans themselves required a hundred amendments. How many stations? How many students to a station? How wide? How deep? One shelf or two? What colors? How much memory for the computers? Which computers? One or two disk drives? How many printers? Models?

Choosing Hardware

Of all the questions our most pressing was, "Which computer?" We needed 20 units, a difficult order to fill for the brand new, if already burgeoning, industry. Choosing the best make for our purposes was a shared but nonetheless enormous

responsibility. Four of the faculty members on the committee owned RadioShack Model IIs and were comfortably familiar with them. With 64K RAM, 8-inch disk drives, and an array of compatible software, the Model II was an attractive contender.

Just before decision time, rumors of an

impending IBM microcomputer began circulating through the corridors. Within a few weeks IBM confirmed the rumors, but it could not promise delivery of 20 PCs during November, our delivery deadline. We heard that IBM had committed much of its production to ComputerLand. The ComputerLand of Memphis was prepar-

Computer Literacy for the People

Now is the time for all good colleges to come to the aid of their students.

"There's a battle outside and it's raging." Actually the battle for computer literacy rages inside, more often than not within the halls of academe. And it's more a struggle than a battle. True, it's not exactly raging, but it is growing. So modify the motto: "There's a struggle inside and it's growing."

Many colleges have boasted computer science departments (or computer divisions of their math departments) for years. The introduction of personal computing, however, has stimulated demand for computer instruction. Previously, computer science departments trained programmers and provided assistance to nonspecialists—in genetics, library science, and history, for example—whose disciplines require at least some facility with computers.

As the number of applications increases and micro hardware becomes more accessible, everyone from math-phobic humanities students to assistant managers of local supermarkets is looking for a place to sign up. Some colleges such as Memphis State have adopted the sensible, but at this early stage, still experimental, lab approach to computer literacy. Others have set goals that incorporate more than one strategy. Duke University provides an excellent example. The venerable Durham, North Carolina institution is charging forward on several fronts. During the past 2 years, it has implemented a campus-wide computer networking system, initiated summer computer camps, established a large computer lab, and introduced micros to clerical levels of the university administration. The IBM PC figures prominently in all these applications.

Duke required a minimum of 100 mi-

crocomputers that would not become obsolete for at least 8 years. Its PC specs included 64K RAM, two floppy disk drives, Zenith monochrome monitors, the UCSD p-System, color adapters, and asynchronous adapters. The university decided on the IBM PC due in part to an arrangement proposed by IBM. The corporation offered a break in the price for its PCs in exchange for Duke's commitment to create a users guide/student workbook, introductory course description, and syllabus. This joint venture agreement is typical of IBM's support of universities.

DUCK Season

Duke University initiated a computer youth camp during the summer of 1981. The first courses, collectively referred to as DUCK (Duke University Computer Kamp), enrolled 236 students. They chose from four 2-week residential sessions and a 1-week nonresidential session. Resident computer campers stayed in undergraduate dorms and shared meals in the cafeteria with university students and faculty. The youths were divided by age and experience into teams, each of which was assigned a camp instructor.

The academic staff included university instructors and local high school math and science teachers who adapted well to the material and were especially good with young people. The camps maintained a one-to-six staff/student ratio for PC lab periods by relying on assistants, many of whom were computer science majors from the university.

Instructors taught general hardware and software principles as well as science, business, education, government,

ing to open but it wasn't ready to deliver such a sizable order. Unable to lay our hands on a real live IBM PC, not to mention 20, we opted for Radio Shack. Then another rumor drifted in from Arkansas: ComputerLand had opened a store in Little Rock and yes, it could deliver 20 IBM PCs during November.

"Which will it be," we asked ourselves again, "Model II or the PC?" One was familiar and trusted with reliable local service and ample software. The other was

The first antistatic carpet threw 1/2-inch-long sparks. Carpenters and electricians crawled all over the walls and ceilings. Committee members struggled over

course outlines and plans for lab sessions.

Courses at the Computer Literacy Lab are open to the community as well as to full-time university students. An observer

(continued)

Instructors taught general hardware and software principles as well as science, business, education, government, and entertainment applications. The entertainment angle proved itself particularly useful as a teaching device. The course load was distributed over 17 classroom lectures and 26 lab sessions. Guest speakers described applications in detail and field trips provided opportunities to observe the PC beast in its natural habitat. Novice campers learned BASIC, intermediate students computed in Pascal, and undergraduates used the UCSD p-System.

In 1982 enrollment jumped to 600. The course emphasis shifted to programming. The previous year's experience indicated that the students were most highly motivated by games, so the new DUCK season stressed game creation rather than participation. At times instructors had to reign in their charges, who, they discovered, preferred games to meals.

Down the Road

The year 1982 also marked the debut of Duke's two permanent computer teaching labs. Both have at least 40 IBM PCs and four or five printers. Instructors expect to minimize reliance on hard copy by requiring floppy disks for homework assignments. Dr. Kevin Bowyer, assistant research professor in computer sciences, explains that disk assignments allow for better evaluation of students' work and more realistic preparation for careers in business, government, science, or education, in which the importance of hard copy is likely to diminish. Bowyer expects that handing out and receiving class assignments electronically may become routine in the near future.

To prepare for that day Duke has placed clusters of five or six PCs at various locations on campus. The IBM PC population at Duke now exceeds 180 units, which inspires Dr. Bowyer and others to envision an extensive network-

ing system that would facilitate file transfers and homework distribution.

The introduction of personal computers has greatly enlarged the role of the computer science department at Duke University. The math and engineering departments have discovered the labs and frequently reserve them for their own purposes. Medical and technical personnel are interested in using the PC to monitor scientifically controlled experiments. Clerical staffers have broadened the university's technical support base by engaging the PCs for word processing and other administrative purposes.

Dr. Bowyer believes these applications are just the beginning. He observes that many faculty members, administrative staffers, and students are unaware of the personal computer facilities available to them or have otherwise not begun to exploit them fully. He expects that once the campus discovers what the PC can do, it will generate greater demand on the network. In fact, Bowyer anticipates that enrollment in the computer sciences will soon reach 80 percent of the student body.

The growing popularity of PCs at Duke and at other institutions has created at least one problem for which a solution is nowhere in sight. If Duke needs 180 copies of a particular copyrighted program, it must buy 180 disks. Software manufacturers devise copyright policies to protect themselves from the abuses of individual users, but the effect on institutional users with limited finances can be very inhibiting, if not disastrous.

By pressing ahead in the struggle to assure computer literacy to anyone who desires it, Duke University provides a model for other schools across the country. The overall effect of the rush to establish new microcomputer applications and literacy labs, camps, and courses is the democratization of computers in America. And that's what revolutions are all about.

- Morgaret Brooks

COLLEGE AND university campuses are converting to computer boot camps.

completely new and unseen and came with only a modest retinue of software. Despite IBM's outstanding service record with mainframes, the availability of local servicing for the PC was untested. With 20 computers in nearly constant use, servicing was a crucial consideration. Still, IBM's record carried some weight. And Charles Brandon predicted exponential growth in software for the PC.

The PC's potential usefulness to our computer science program gave it the lead. It is a 16-bit machine at the beginning of its life cycle, as opposed to an 8-bit machine at its peak. Its capacity for expansion—an empty 8087 numerical processor socket and five expansion slots—made it more alluring. A cottage industry was already beginning to produce components and software to extend the adaptability of the PC and IBM was talking about producing a series of operating systems, including a version of UNIX. After assessing these considerations, we decided to go with the IBM, and none of us at Memphis State has regretted it.

The Lab

With the computer order placed, we shifted our attention to the Computer Literacy Lab. There was still plenty of work to do. A separate air conditioner was installed, not for the summer, but for winter. The University's cooling system worked fine but its heating was overwhelmed.

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stepping into a lab session could find businessmen, housewives, professors, retired couples, and popular rock singers among the 24 students working in the carrels. They use their 3 hours a week to write simple programs; experiment with word processing, electronic spreadsheets, and data base packages; and extract information from public access data banks such as The Source.

Many students were skittish at first. Now excitement and enthusiasm are more evident. A constant clamor fills the room. "Do you know how to fix titles on VisiCalc?" "Can you help me? I can't get THDB (Tiny Hierarchical Data Base) to print out what I want." "Come and see what this little program is putting on the screen!"

The Course

The Computer Literacy Course eases students in. Starting with "What Makes a Computer Compute?" it goes on to discuss the impact of computers on organizations and society. Technical subjects such as digital logic and the manufacture of silicon chips are treated lightly. The lecturers cover other subjects, such as the gross architecture of a computer, with more care and attempt to make unfamiliar words (or unfamiliar contexts of familiar words) such as assembler, compiler, interpreter, and operating system meaningful concepts to the students.

We rely heavily on case studies as aids in learning applications. And because many of our enrollees are considering purchasing microcomputers for their homes and/or businesses, we discuss these applications and study the life cycle of business computers. We culminate the course by studying such societal issues as privacy, the effects of computers on the labor force, and computer crime.

Students spend as much time in the lab as in the classroom. In the first lab session they combined NAND and NOR gates into flip-flop circuits and half-adders. By midsemester they had embarked on course projects. They were required to produce their reports on a word processor and use at least one of the other software packages they had studied (or perhaps a program of their own).

One student combined a voice synthesizer with an IBM PC to give lessons in French. Another produced and analyzed student surveys for an exercise class. One

of the more unusual projects was a program to teach the Lord's Prayer to deaf children. The most sophisticated was a load analysis program to determine cargo and fuel weights and placement for aircraft.

The lab sessions are headed by Austin Smith with two assistants. For some applications programs they relied on tutorials from the manuals. For others, we prepared

THE IBM PCs valiantly withstood inexperienced use and abuse.

our own detailed instructions. We assigned regular graded lab assignments. After discovering that the original 3-hour lab sessions were too long (the last half-hour was usually unproductive), we adjusted the format to two 90-minute sessions per week. This schedule is working well.

Other Uses of the Lab

This past summer we offered two 1-week computer day camps for junior high school students. In each, 30 seventh and eighth graders spent 3 hours in the lab every weekday morning learning to program the IBM PCs in BASIC. We taught by experiment; the students were given brief instructions and encouraged to experiment for themselves. For example, an instructor would ask them to fill the screen, draw a triangle, or build a Christmas tree using the commands Locate, Print, and For...Next. By the end of the week the students were flying solo, making pictures on the screen and printer, designing games, and generally having a ball.

In September we added a Seattle Computer memory board with an additional 64K RAM (expandable to 256K and containing a serial port) to each PC. This allowed us to use IBM's Macroassembler for teaching a graduate level microcomputer programming course in the Literacy Lab. This course concerns itself with the organization and assembly language programming of the IBM PC. Enrollment is restricted to 15 students, one per lab station.

The Lab has been used by students of a finance class from the School of Business and by various elementary math classes. University instructors with 200-student sections use the lab's VisiCalc for record keeping. Marathon Saturday workshops entitled "The Personal Computer for Home and Office" are scheduled for fall and spring. Three-day training seminars for Federal Express managers are to be held once a month beginning in January. The corporation will limit enrollment to 15 participants, one for each computer. We are considering using the lab for beginning computer science courses. To this end, the department has acquired a Pascal compiler. The possibilities seem endless.

One Year Later

We circulated a questionnaire the last day of class that confirmed student enthusiasm for the course. "I've lost my fear of the computer/techno revolution," one student remarked. "I now realize that computers are here to stay and I'll devote my energies to using them instead of fighting them. Big change for me!"

The IBM PCs valiantly withstood inexperienced use and abuse. One even survived the overflow of an air conditioner drain onto its keyboard. During 9 months of operation, we've had only a couple of minor disk problems and have replaced only three memory chips. Austin Smith has learned computer maintenance from IBM technicians. Equipped with a full kit of replacement parts, he has had little trouble keeping the equipment running.

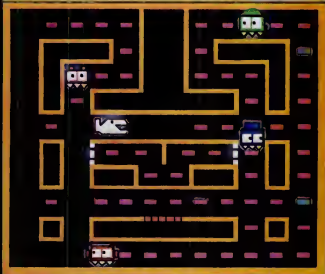
The Epson MX-80 printers, which are essentially the same as IBM printers, interface with no effort. Our supervisor's station contains a two-drive IBM PC with a Radio Shack Daisy Wheel II letter quality printer attached. Again, interfacing these two pieces of equipment posed few problems. The Radio Shack direct-connect modems allow our PCs to communicate with other computers via telephone.

Our first semester is over and the second is under way. We are pleased with the students and faculty and are proud of our Computer Literacy Lab. /PC

Ston Frunklin, Ph.D., is the Choirman of the Department of Mathemotical Sciences at Memphis State University, Tennessee. A mathemotician by training, he has become addicted to personal computing both at home and at work.

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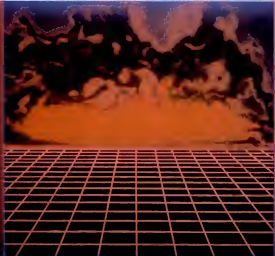
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Computer Camps

Computer camps can now be added to the already substantial list of well-intentioned strategies designed to lure the wary public into something resembling friendship with computers.

The anxieties and fears aroused by being away from home for the first time could hardly be evoked more appropriately than in the still-intimidating and arcane world of microelectronics. Computer camps try to allay unnecessary fears and offer a variety of courses ranging from how to move the cursor with confidence to programming sophisticated graphics and sound. There are camps for educators and professionals—camps for everyone from reluctant adults to the most unflinchingly eager children.

Before going to a camp, prospective participants should beware of buying what they don't want, can't understand, or don't need. Faced with an array of nearly identical services and features, they would be wise to consider the following: languages, special curriculum, cost, accreditation, teacher-to-student ratio, computer-to-student ratio, types of computers used, levels of experience and age groups, and special offerings.

A Day at Camp

A day at a typical computer camp begins at 8 a.m. with a class in BASIC consisting of a 1-hour lecture on programming concepts followed by hands-on practice of the day's lesson. Special projects in sound or graphics may also be included. For those new to computers, the first few classes are spent mastering general keyboard functions and learning to play games. In the afternoon participants attend advanced classes in electronics, robotics, networking, or more programming languages. Free time may be spent working on special projects, such as designing

programs for a parent's business or competing in a computer game tournament.

This nearly complete day-and-night immersion in computer activities serves two distinct purposes. The first is to learn for the sake of learning—an endeavor that yields its own rewards. The second, more practical purpose is to give a head start, hence a competitive edge, to adults in the workplace and to children in school. Given the ever-increasing importance of computer literacy, this head start is rapidly becoming a major advantage.

Languages

Instruction in computer languages constitutes the major part of the curriculum at computer camps. BASIC seems to be the most popular, followed by Pascal, LOGO, PILOT, APL, FORTRAN, and assembly. Most camps also teach participants to program microcomputers and often specialize in specific languages. However, not all camps provide instruction in advanced programming languages—a limitation for

participants who are already experienced programmers.

All microcomputers can be programmed with BASIC, which is usually the first language taught. After learning BASIC, participants can study any other language offered, according to their needs and interests. The IBM PC can use languages such as BASIC, LOGO, Pascal, FORTRAN, and FORTH. LOGO and PILOT, both relatively new languages, are designed to teach young children programming concepts by using conventional English and straightforward graphics. Learning LOGO or PILOT first is sometimes preferable for younger computerists.

Special Curriculum

The curriculum at some camps is specifically designed to help teachers manage computer projects at their schools and to teach them innovative ways to use computers in the classroom. A few camps even offer vocational training in word processing and computer literacy. One camp in



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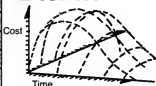
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Arizona that specializes in environmental issues allows participants to work on conservation projects with computers. The University of Connecticut Health Center runs a camp for diabetic children that uses computer games and programs to teach them how to manage their health. This innovative approach may be extended to include children with other kinds of disabilities such as cerebral palsy and skeletal abnormalities.

A FEW CAMPS offer vocational training in word processing and computer literacy.

Cost

The cost of attending a computer camp varies with the length of stay and the extent of training. Prices range from \$30 for a 3-hour workshop to \$1,000 for a week of instruction, food, lodging, and activities. The average cost per week is \$400 to \$450; however, some camp sessions last longer than 1 week. Most tuition costs cover room and board, but check with the camp directors to see if there are any hidden costs such as fees for diskettes or recreational activities. Some camps offer scholarships to needy students, and local service clubs may also provide financial assistance.

Accreditation

Many computer camps are not accredited, usually because they are so new. You can check the credentials of a particular camp in several ways: Contact the American Camping Association to find out if the camp is accredited. Ask the camp director about the staff members' credentials, and get an expert opinion on the camp's curriculum.

Teacher-to-Student Ratio

The teacher-to-student ratio should ideally be one to one, but this is seldom the case. Prospective participants should try to find a camp that offers individual attention and small-group support. Find out if

the camp allows participants to pursue personal interests such as graphics, game development, or music during free or scheduled time.

Types of Computers Used

Most camps provide hands-on experience with a variety of microcomputers. However, if participants already own a PC, they should be sure that the programming instruction they receive will be compatible with it. Although many camps do not use the IBM PC, growth in both the popularity of the PC and of computer camps will probably change that.

Computer-to-Student Ratio

To avoid the somewhat exaggerated

scenario of queuing up the previous night to guarantee access to a computer, prospective participants should find out from the camp director how many computers will be available per student. While some camps can offer each student a computer, the usual ratio is one computer to every two camps.

Experience Levels

Some camps and workshops cater strictly to the novice, providing increased comfort and familiarity with computers. Others have prerequisites in programming ability and experience, and some may concentrate on software development or on advanced topics such as robotics and electronics.

Selected List of Camps

A sampling of summer computer camps for adults, educators, and children.

One or two computer camps first appeared in 1980. These were followed by a phenomenal period of growth to over 50 camps in 1982. The summer of 1983 will probably bring several hundred new camps, and so far no directory exists to keep track of them. To supplement this list of camps, check with local colleges and computer stores. Other good sources for finding camps are summer edition college catalogs and computer magazines.

Computer camps and institutes are located primarily on the East and West coasts (which is likely to change by next summer) and are usually situated in or near college campuses. To really get away from it all you can take computer classes in between scuba diving and water skiing lessons in exotic Club Med locations such as Sicily, Mexico, and the Bahamas.

The camps included in this list were held during the summer of 1982 and the information about them was taken from their respective brochures. This list, although not comprehensive, offers a sampling of the types of camps available. It does not include an evaluation of camp services or programs.

The list is divided into three sections: Adults, Educators, and Children. The camps are listed geographically within each section. All available information on the categories of camp selection criteria

(location, cost, teacher-to-student ratio, computer-to-student ratio, level of experience, and other offerings) is included. Unless otherwise indicated, all costs are per person. If any category is not listed, the pertinent information was not available.

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Weekend seminars for adults
Languages: BASIC, Pascal
Location: Moodus, Connecticut

Age Groups

In general, summer computer camps were developed for children between the ages of 8 and 18, with the average age reported to be 12. One camp director remarked that some computer whiz kids have already begun to work and have no time for camp; some have even organized their own companies. Some camps do not cater exclusively to children. The Family Computer Camp in Potsdam, New York, encourages entire families to learn about computers. Others, such as special teachers' institutes and some Club Med facilities, are geared specifically for adults.

Special Offerings

Synthesized music and computer ethics are two of the special courses offered at certain computer camps. Others include courseware development and software evaluation designed specifically for educators. Field trips, guest speakers from computer companies, and films also supplement the curriculum of many camps.

Individual instruction and supervision are integral parts of any computer camp's program. Counselors can assist in teaching such traditional values as honesty and fair play by demonstrating their relevance to computing. "Thou shalt not steal," updated to a high-tech commandment, becomes, "Thou shalt not pirate thy neighbor's program, sabotage thy neighbor's data files, nor access thy neighbor's account."

One may legitimately ask whatever because of good, old-fashioned fun and games. Although some consider computing full-time recreation, most camp directors also encourage participants to indulge in traditional summer camp activities such as swimming, hiking, or tennis.

Sending your child or yourself to computer camp can be a valuable investment. With the increasing use of personal computers and the need for computer literacy, computer camps will be springing up throughout the country, offering traditional modes of exercise and fun as well as helping to develop computer skills in a relaxed atmosphere. /PC

Barbara Horvitz is a free-lance writer who specializes in education. She also works for ComputerTown, a nationwide computer literacy project sponsored by the National Science Foundation.

Cost: \$299 per person, \$549 per couple
Experience/age: Novice adult
Other offerings: Word processing, accounting, home applications, swimming, golf, tennis

FAMILY COMPUTER CAMP

Conference and Information Center
Clarkson College
Potsdam, NY 13676
(315) 268-6647
One-week sessions for families
Language: BASIC
Location: Potsdam, New York
Cost: \$270-\$300 (board not included)
Experience/age: All levels and ages
Other offerings: Word processing, graphics, home applications

West Coast

COMPUTER CAMP FOR GROWN-UPS

8 Benton Ct. #4
Tiburon, CA 94920
(415) 435-1310
Adult version of Computers for Kids
camp held during the year
Language: BASIC

YOU CAN TAKE computer classes in between scuba diving and water skiing.

Location: Marin County, California
Cost: \$395 for 4 days
Experience/age: Novice adult
Other offerings: Word Processing, hot tubbing, hiking, swimming

COMPUTER CAMP, INC.

1235 Coast Village Rd., Ste G
Santa Barbara, CA 93108
(805) 969-7871
Week-long computer camp for adults
Language: BASIC
Location: Santa Barbara, California
Cost: \$600 per week for tuition
Computers: Atari, Commodore, TI, Apple
Experience/age: Novice adult
Other offerings: Word processing, ac-

counting, financial forecasting, purchasing equipment

EDUCATORS

East Coast

COLUMBIA UNIVERSITY TEACHERS COLLEGE

Summer Workshops
525 W. 121st St.
New York, NY 10027
(212) 878-3740
Languages: LOGO, BASIC, Pascal, Pilot
Location: New York, New York
Cost: \$175-\$295
Experience/age: Novice adult
Other offerings: Software evaluation

South

NORTH CAROLINA SCHOOL OF SCIENCE AND MATHEMATICS

Summer Workshops
P.O. Box 2418
Durham, NC 27705
Two-week sessions for high school math and science teachers
Languages: BASIC, Pascal
Location: Durham, North Carolina
Cost: \$125
Experience/age: Novice and intermediate adults

Southwest

UNIVERSITY OF TEXAS

EDB 458 LRC
Austin, TX 78712
(512) 471-5211
Six-week, 3-credit course for teachers
Language: BASIC
Location: Austin, Texas
Experience/age: Novice adults
Other offerings: Software evaluation, purchasing advice

Midwest

MCGRAW-HILL MICROCOMPUTER CURRICULUM WORKSHOP FOR EDUCATORS

(800) 223-4180
Two-day workshops
Locations: Indiana, Michigan
Cost: \$225 for tuition

Experience/age: Novice adults
Other offerings: Software and hardware evaluation, applications, funding, managing computer projects

West Coast

MICROCOMPUTERS IN EDUCATION

105 School of Education
Stanford University
Stanford, CA 94305
Three- and 6-week sessions
Languages: BASIC, LOGO
Location: Stanford, California

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La Grande, OR 97850
(503) 963-2171

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Eugene, OR 97403
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40 E. 34th St.
New York, NY 10016
(800) 847-4180
Four-week sessions
Locations: California, Wisconsin, Pennsylvania, North Carolina
Cost: \$1,590 per session
Computer: Atari
Computer/student ratio: 1 to 1-2
Experience/age: 10-18

COMPUTER CAMP, INC.

1235 Coast Village Rd., Ste. G
Santa Barbara, CA 93108
(805) 969-7871
Two-week sessions
Languages: BASIC, Pascal
Locations: California, Massachusetts, London

Cost: \$795 per session
Computers: Atari, TI, Commodore, Apple
Computer/student ratio: 1 to 2
Experience/age: All levels, ages 10-18

East Coast

NATIONAL COMPUTER CAMP

P.O. Box 624R
Orange, CT 06477
(203) 795-3049
One-week sessions
Locations: Connecticut, Georgia
Cost: \$345 per week
Computers: Wang, Apple, TRS-80
Experience/age: All levels, ages 10-18

COMPUTER CAMPS INTERNATIONAL

310 Hartford Turnpike
Vernon, CT 06066
(203) 871-9227
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Languages: BASIC, Pascal, LOGO, APL, Assembly

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 1631 S. Willard St.
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Location: Burlington, Vermont
Cost: \$325 per week
Computer/student ratio: 1 to 1
Experience/age: 10-16
Other offerings: Computer ethics, graphics, sailing, canoeing

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Podiatrics Dept.,
University of Connecticut Health Center
 Farmington, CT 06032
One-week sessions
Location: Simsbury, Connecticut
Cost: \$375

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 c/o International Education
 51 Spring St.
 Watertown, MA 02172
 (617) 923-7707
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in several languages.
Location: Chestnut Hill, Massachusetts
Cost: \$475 per session
Experience/age: Beginner to advanced, ages 8-15

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 (615) 835-0064
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 Sheridan and College Roads
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Experience/age: Beginner, ages 12-18
Other offerings: Word processing, graphics

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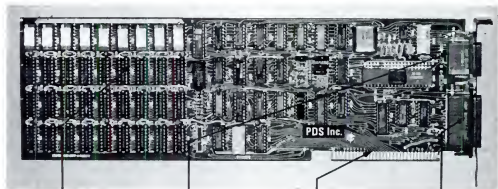
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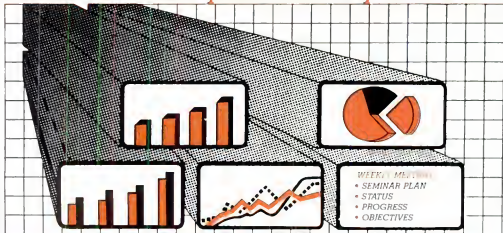
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IBM faces the challenge of tight budgets, limited courseware, and growing competition for the classroom market.

The PC Goes To School

The computer revolution is old news. During the past 20 years, the miracle machine has found its way into every conceivable niche in corporate America. Revolution is now evolution in the business arena. The computer has taken its time coming to class, however, and the course of its evolution in schools remains a critical concern of educators. Teachers have always been faced with the task of making their students literate, but with the dawn of the Computer Age, they have found that they must also make them computer literate. When the microcomputer was introduced in 1977, they hoped that they could combine the former goal with the latter. The results have been erratic but encouraging.

Gameware Becomes Courseware

Computer-assisted instruction (CAI), the use of computers as learning tools in the classroom, began when several arcade game makers realized that their programs

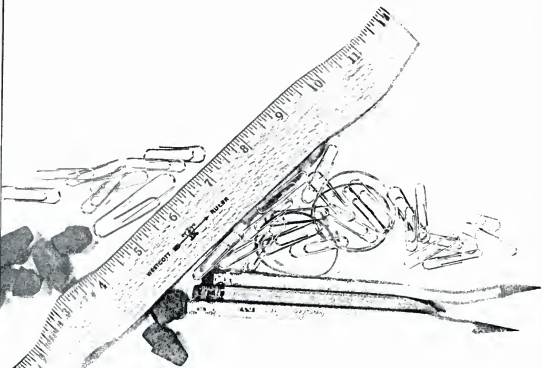
could be modified to combine learning with planet wrecking. Psychotechnics, Inc. of Chicago got the ball rolling by developing 80 math programs (designed by elementary and secondary school teachers in San Diego) with this competitive learning approach. Simple, nonprogrammable microcomputers were assembled to run the programs. The package, a dedicated CAI system that provided math drills and games for elementary and junior high school students, was called *Telemoth*. The cost of the programs was reasonable (\$800 for the complete set) and *Telemoth* was a modest success.

Today *Telemoth* is used in 33 California school districts. New impetus has been given to the program by Psychotechnics' decision to abandon its original micro in favor of the IBM Personal Computer. This software conversion will be one of the largest undertakings for the PC. Still, *Telemoth's* appeal and distribution are limited

because it remains game- and drill-oriented at a time when educators are looking for more sophisticated courseware.

The majority of educators continue to look to the first wave of microcomputers led by the Apple II. The Apple, Atari, and various Commodore micros dominate the expanding school market. They have the corner on the market in terms of cost and courseware for classroom instruction. When their inexpensive hardware hit the market, software houses and a few publishers rushed in to try to fill the need for educational software. The result was a jumble of hastily conceived courseware, much of it game-oriented. More sophisticated programs were provided by Minnesota Educational Computer Consortium (MECC), CONDUIT (a ten-college consortium based at the University of Iowa), and other groups, but the need for quality courseware is yet to be filled.

Now the second wave—the 16-bit



wave—is upon us. The name IBM is on the lips of those who only a short while ago were content with the passions and pains offered by the Apple and other early mi-

The PC Goes to Class

Tight budgets make school administrators keep an eye on the bottom line. The PC is more expensive than the 8-bit micros currently used in the classroom. A PC may offer more byte per buck, but why drive a Cadillac when a Honda will do?

By most standards the PC is a superlative microcomputer. Its features make it attractive to both the number-crunching MBA and the teacher looking for a versatile machine for computer literacy and programming classes. The PC is hard to resist with its 16-color graphics, multilanguage capabilities, programmable user keys, large and expandable memory, quick disk access, and, of course, its 16-bit microprocessor. Many see the PC as the machine powerful enough to run school administration programs or perform successfully in the classroom.

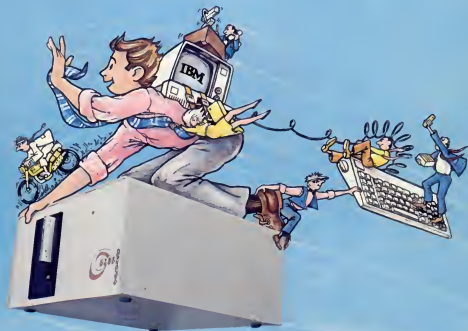
But what do these sophisticated capa-

***P**SYCHO- technics got the ball rolling by developing 80 math programs.*

cros. Home users and businesses seem to be responding to the PC's charms; 300,000 units have been sold since its release. IBM hopes, by dint of name identification and technology, to grab a share of the lucrative school market to round out this triad.



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bilities mean to the teacher hoping to improve CAI quality? True CAI embraces more than computer literacy or programming; it involves using computers for teaching all subjects—math, English, and social science—and depends on adequate courseware. Some PC courseware is on the market, but it is limited in both scope and quantity.

Is the PC sophisticated enough to run the complex programs of the future and remain simple to use? Perhaps. The appeal of courseware (and CAI) goes beyond drill and practice applications; it lies in the ability to engage a student's imagination and hold it. This requires a program that can interact with a student; assess the student's performance; and combine simulation, graphics, animation, and sound to teach effectively and vividly. If the program can relieve the teacher of record-keeping chores, so much the better.

The PC appears to fit the bill. In addition, school administrators hesitant to start or expand CAI programs see a familiar, reliable name. The IBM logo stands for

quality and, better still, the assurance that the machines will still be made and supported for years to come. The PC fills needs in computer literacy and program-

A FEW publishers rushed in to try to fill the need for educational software.

ming classes and is made with future courseware in mind.

"If courseware is going to improve, you have to have graphics, simulation, and much more," says Ruth Wagy, a programming teacher at St. Andrew's High School in Boca Raton, Florida. "You need a sophisticated machine like the PC."

Simon Greenstein, head of the com-

puter center at Torrey Pines High School in San Diego, California, concurs: "The PC gives us a lot of flexibility for the future. It's a powerful machine. The Apple and Atari were good computers in their time, but the PC is one of the first of the new wave. We have to prepare our students for the '80s and '90s."

Doug Cobb, a PC software programmer for DesignWare of San Francisco, adds, "The PC has all kinds of capabilities that the Apple doesn't have. The multifunction keys alone make it more user-friendly. Kids can use those keys without knowing anything about the computer; this is an advantage in CAI. And because of its design, the PC can be used for a wider age range of students."

Teachers Grade the PC

Successful school use of the PC depends on the computer literacy of the teachers and the amount of planning put into the CAI program. If the PC is the first computer a teacher has been exposed to, problems can start piling up. The user

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manual, which is not a tutorial guide, can give even an experienced user the jitters. Unless the PC is bought from and installed by a dealer familiar with schools, little in-service training is available. PCs have been known to sit in storage for months while schools figure out what to do with them.

"I'm getting a lot of flak," said one frustrated teacher in Northern California. "Everybody has an Apple and people are saying, 'Why are you bothering with the PC?' The keyboard is very sophisticated and all the special keys are great, but I really don't know how to use them yet. We need someone to train us. And we need courseware."

Those who have been through the wringer with the Apple and other micros usually have fewer problems with the PC. A programming background also helps. Planning, above all else, is the key to success. Two schools that aptly illustrate this are Torrey Pines High School in San Diego, California, and St. Andrew's High School in Boca Raton, Florida.

St. Andrew's is a Catholic high school located in IBM's hometown. The local community is supportive of the school's efforts in computer literacy. IBM originally loaned St. Andrew's two PCs. The school bought two more and, with its older complement of four Apples, began to expand its computer classes. Ruth Wagy, computer science teacher and director of the program, offers three beginning programming classes, one advanced class, and one workshop in Pascal. Her work has been so popular that nearly a quarter of the students attend one of these classes.

"I started out 4 years ago with only six kids in the class," Wagy recalls. "We had Apples first. When we later got the PCs, the kids weren't enthusiastic. They had learned on the Apples and saw no reason to change. One of the boys who complained the loudest won't even touch an Apple now. They love the PCs. We have to kick them out at the end of the day."

"The PC makes programming fun. The graphics are much better than the Apple's. The editing features are outstanding. The kids make lots of mistakes, so they are overjoyed to find that they can edit easily. The renumbering command is helpful too. We run our PCs in FORTRAN and Pascal. That's another advantage—you just buy the software and you don't need a language card.

"The PC's character set is superior too. And it has music. One of my students wrote a program that drew the music staff on the screen. You tell the computer the notes you want to play, and it puts them on the staff and stores the song in a file. When you want the song, you call it out of the file, and the computer plays it back while displaying the notes.

Wagy is enthusiastic about the PC, but she admits that even with her technical background it's a difficult machine to get up and running. The user manual is confusing at first. Because the machine has so many features, this confusion can be maddening.

"I wanted to show the kids how to do graphics," she relates. "I had to go through the manual from beginning to end and pull out anything having to do with graphics. Everything was scattered throughout the book. It took me a long time to figure out how to get the soft-key display on and off the screen. It's frustrating because there are so many things you can do with the PC."

THE PC FILLS needs in computer literacy and programming classes and is made with future courseware in mind.

Though St. Andrew's has focused primarily on computer literacy and programming, it also uses the PC for true CAI. But with little courseware available, Wagy has had to make do with software such as VisiCalc and EasyWriter. Word processing seems to be a way of luring the computer wary to the keyboard. Students can use EasyWriter for assignments, and teachers can use it for course planning, tests, and even preparing ditto masters.

"We're planning to use the PC for CAI," says Wagy. "There isn't much quality courseware out for any micro. What is out is either dull or not educationally sound. Now the MECC courseware (currently on Apple) is terrific, and I trust it

will be available for the PC. I'd recommend the PC for CAI. Right now there's a lack of PC courseware, but what does come out is worth the wait. The PC business software seems to demonstrate this."

This feeling is echoed by the staff at Torrey Pines High School. The school's computer center, which includes 12 PCs, is open all day throughout the year for students and teachers. "If you want to make a school into a computer school," says director Simon Greenstein, "you'd better train the staff."

At Torrey Pines, computer use is encouraged and courses in computer literacy, business software, and staff training are offered. VisiCalc, Volkswriter, and other business packages are being used to introduce students to the skills of the business world. Journalism students use word processing packages to prepare the school newspaper, saving typesetting costs while they acquire new computer skills.

The rapid growth of computer courses at Torrey Pines was the result of determined planning. "We formed a committee consisting of staff from UC Irvine, our school, and Ken Bowles, the developer of UCSD Pascal," says Greenstein. "We discussed what we needed and how we would introduce computer technology into our curriculum. Then we looked for a computer to fit that curriculum. The PC was it."

Greenstein is quick to point out that getting the PC was a risk. The machines were expensive and no software was available when they first received their machines. Faith in IBM and the software industry sustained them. Greenstein is somewhat skeptical about courseware for CAI, however. "Ken Bowles gave us the best advice. He told us that self-generated courseware was not very time-efficient. CAI is a function computers can serve, but we're not stressing that."

The desire for courseware is nonetheless strong at Torrey Pines. The school's measured response to the courseware shortage—focusing on computer literacy, programming, and business software manipulation—is in many ways preparing teachers and students for courseware to come. Greenstein was animated when discussing the possibilities of SAT preparation programs or of using CAI for math, English, history, and other subjects. Like so many schools edging into CAI, Torrey Pines is being cautious.

Bruce Reynolds, a computer science teacher at Torrey Pines, agrees with Greenstein but is a bit more optimistic. After surveying a number of companies and institutes that produce courseware, the staff decided to involve itself with the Educational Technology Center at UC Irvine. "They have programs that are interactive and use good screen design that are being converted to the PC," says Reynolds. "Computer literacy projects will be available, and we're a part of that. We're helping to write some of those programs and we will receive them for distribution in the school."

"The programs are very sophisticated, but it's not hard to get programmers. It's harder to find good teaching materials and curriculum design. The only people who are experienced at that are teachers. UC Irvine is inviting teachers to work with them in designing programs and writing scripts."

The finished courseware will be available for use on the PC through the Center or through an educational publisher. At

this point, however, no one has been willing to invest the money necessary for wide-scale marketing. "We've been quite successful in getting funding for develop-

THE PC GIVES us a lot of flexibility for the future.

ment," said Werner Feibel, a project director at UC Irvine. "We're trying to get publishers to help us put these materials into some sort of marketable form, but it's difficult to get them to think along those lines. The biggest problem is that it's hard to talk to anybody if you're not talking about Apple."

Marketplace realities intrude even at the university. The first programs for the PC will be conversions of existing Apple courseware followed by CONDUIT pro-

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PC MAGAZINE 213 DECEMBER 1982

Francisco, says, "What educators have to understand—what we all have to understand—is that it takes time to build something good. IBM is very concerned about its name. We feel that when the courseware does come out, it's going to work; it will establish a standard of quality."

"CAI is not necessarily going to turn out the way we've been told all these years. It may not be tutorial or like *Plato*. It may have more simulation, problem-solving situations. If nothing else, we're giving kids computer literacy and teaching them how to handle the unit. There are 300,000 PCs out there already. If you want to be able to survive in this job market, you'd better learn how to operate a PC. That might be as important a reason as any for having one."

Who'll Go to the Head of the Class?

The controversy surrounding the use of the PC in the classroom will no doubt continue. Having entered the market late, IBM has been slow to catch on to some of the needs of schools. Almost everyone connected with the PC—users, teachers, courseware developers, and engineers—notes IBM's failure to support courseware development and interact with schools.

Apple, Atari, and Tandy Corporation have divisions solely devoted to the educational market and to bringing courseware

for it is still a problem. Outside of IBM there are only a fistful of distributors. The planned Sears outlets have so far failed to materialize. In Silicon Valley, the center of the computer industry, one Sears store had only three PCs, which were jostling for space with stereos and televisions. To improve distribution, IBM has contracted with educational technology firms such as Photo and Sound to market the PC and provide training. This move alone has done much to bridge the gap between IBM and the schools.

But the question still remains: Should

educators buy PCs for classroom instruction? The Apple IIe, a highly competitive micro, will be available soon. The Commodore 64 is out already; purchasing one could be a cost-effective way of buying 64K memory and 16-color graphics. The answer seems to be that schools can either wait and see or buy and wait. */PC*

Gary Young is a courseware writer who lives in Northern California. He has written for *The Hudson Review*, *Book Forum*, *American Film*, and the *San Francisco Chronicle*.

**HOW THE
market will change
during the next 5
years is anyone's
guess.**

writers and publishers together. IBM has recently formed an education division and has seeded some PCs at a number of schools in the East. Notable in this effort is IBM's backing of Dr. John Henry Martin's "Writing to Read" project. It uses the PC and audio reinforcement to boost reading and writing abilities of first, second, and third graders throughout the East Coast and parts of the Midwest. The preliminary results are impressive.

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LOGO: A Language For

Ancient by microcomputer standards, this language is at once so simple and sophisticated that newcomers can create graphics from the first command.

No, it's not a do-it-yourself video game. Nor is it an illicit screening of pirated outtakes from *Star Wars III*. The microcomputer is operating in a highly interactive, graphics-based language called LOGO. On the monitor LOGO conjures up turtles that draw and sprites that take on any imaginable shape. These highly trained creatures derive from perhaps the simplest command structure available. For this reason, LOGO is well-suited for introducing microcomputers to newcomers. In fact, its proponents look forward to the day LOGO will replace BASIC as the *lingua franca* of computer literacy.

Although LOGO's creature characters have childish names and many elementary and high schools teach only LOGO in their computer science classes, the language is not child's play. Nor can it be dismissed simply as training wheels for more difficult computer languages. To an adult who knows BASIC, a cursory examination of available commands and an hour or two at the keyboard will elicit a great respect for the power of LOGO's simplicity.

The Vision of LOGO

LOGO is by no means a new language. Its origins predate the computers for which it was designed. Seymour Papert, the creator of LOGO, began working with children and computers in the late 1960s when he was professor of applied mathematics and codirector of the artificial intelligence laboratory at the Massachusetts Institute of Technology (MIT). His vision extended beyond its immediate applications (teaching arithmetic and geometry) to create an educational system in which children could learn to manipulate computer-based machines and discover new capabilities. From that experience, Papert believed, children would learn the power

of applied knowledge and gain self-confident, realistic images of themselves as intellectual agents.

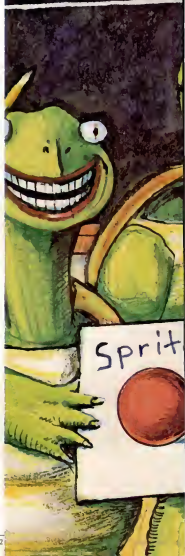
Papert and his team carried out most of their research at MIT. In those early days they anticipated an era when computers would be small enough to sit on a desk top and inexpensive enough so that every child could have access to one in school. After studying their potential applications and capabilities, Papert began to envision a customized language for microcomputers of the future. Thus the idea of LOGO was born.

The challenge in creating LOGO was finding the best method of facilitating communication from child to computer. Papert believed that 2-year-olds talk to humans more proficiently than high school computer students talk to a computer in BASIC. He reasoned that there must be a technique for learning computer language that mimics the way children learn to communicate with other people.

Kids learning to talk discover an infinite number of things to talk about. For them, learning a language is both interesting and practical. The same cannot be said about computers; for newcomers there really isn't much to discuss. Consequently, Papert emphasized graphics as the subject of conversations with computers.

Papert had access to larger computers to aid in development of the new language. The central figure of LOGO was a three-dimensional "turtle," a robot device controlled by the computer. Several early versions looked like miniature replicas of an armless R2-D2, the short, heeping automaton of *Star Wars* fame. The turtle was highly mobile and responded to simple English commands, called "primitives" in LOGO, such as Forward and Back, or Right and Left. All the user had to do was specify values for each primitive. When

ASSIGN





Children Of All Ages

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2. BALL
3. TRUCK
- 4.
- 5.



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placed on a blank piece of paper on the floor, directed to put its pen to the paper and move forward 50 and turn 90 four times, the turtle would draw a square 50 units per side.

Three-dimensional, motorized turtles are still available. However, a less costly and more flexible alternative is to represent the turtle with a triangle on a computer monitor and control its movements

angles. They no longer memorize shapeless formulas, but learn by doing something interesting—creating screen images.

Early experiments with LOGO as a math teaching tool have shown encouraging results. One test at a Massachusetts junior high revealed that most students were highly motivated, even when tackling projects several weeks long. The students preferred to make many small discoveries along the way, building on experience gained in earlier steps of the project, to learning by the usual chapter-by-chapter method of working on small sets of repetitive problems for every new concept. Today, LOGO is finding its way into school systems that have the foresight and finances to include computer education in their curricula.

How LOGO Works

The features found on Texas Instruments' TI-LOGO cartridge, which has ad-

vanced graphics characteristics not necessarily found on other implementations of LOGO, best exemplify the language's capabilities. At the start of a session or after a Clearscreen command, the turtle appears in the screen center as a small triangle facing up (north). Typing in a Left or Right primitive causes the turtle to spin the specified number of degrees. Forward makes the turtle move ahead, trailing a line behind it. There's a surprising amount of flexibility in pen control, so it's easy to erase lines or move the turtle to a new location without leaving a trail. By making the turtle invisible, users can draw lines without the apparent aid of any screen indicator.

Users can create new shapes or characters with the Makeshape primitive. To make shapes, the user works on an expanded 16x16 grid of 256 boxes representing pixels. The user moves the cursor to each box, opting to either fill it in or leave

A CURSORY
examination of
available commands
and an hour or two at
the keyboard will
elicit a great deal of
respect for the power
of LOGO's simplicity.

with the same primitives. So far, LOGO has been adapted to three microcomputers: the Apple II, Texas Instruments' TI-99/4A, and Radio Shack's Color Computer. Interactive Sciences, Inc., a California-based nonprofit organization dedicated to research and dissemination of information on computers, has written a version of LOGO for the IBM PC. It was developed as part of a recent, intensive teacher training seminar at Stanford University. Interactive Sciences has announced no plans to market IBM PC LOGO commercially.

Within the LOGO method of mathematics instruction, the turtle is essentially a transitional object that links the subject matter to a student's knowledge. The student learns by manipulating the turtle. He or she actually becomes the teacher of a turtle-student who responds unflinchingly and patiently to properly conceived instructions.

Consider the example of the square. Children may recognize a square when they see one but may not understand the elements of its construction. By manipulating, or "teaching," the turtle through trial and error, they see that a square requires four equal sides and four equal

LOGO Commands

TI LOGO features a total of 116 different primitives. These commands demonstrate some of the more advanced powers of LOGO.

BOTH condition 1 condition 2

Gives true if both conditions are true.

Example: TEST BOTH :X<:Y :Y>:Z

CALL thing "name

Gives a value (7) to a name (X).

Example: CALL 7 "X

CONTENTS

Prints an index of names, procedures, and sprites in active memory.

DEFINE "procedure name [list]

Gives a procedure name to a list of commands.

Example: DEFINE "X [N][FORWARD :N RIGHT 90]

TELL TURTLE

X 40

EDIT name of procedure

Allows editing of the named procedure.

EITHER condition 1 condition 2

Gives true if either of the two conditions is true.

RANDOM

Gives a random number from 0 through 9.

RC?

Returns true if a key has been pressed.

READCHAR

Waits for a key to be pressed and gives the key character.

SAVE

Enters the SAVE mode for saving procedures, shapes, and tiles.

—D.G.

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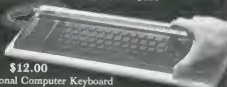
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it empty. Up to 32 of these new shapes may be stored in memory and may even be named. The user can then recall a design and command one of 32 sprites to carry it to the desired screen location.

A sprite is a creature to which the user can assign any combination of shape, color, speed, and direction (Heading). Five of the 32 sprites have preassigned shapes: plane, truck, rocket, ball, and box. If more than 27 new shapes are needed, however, these five may be altered in the same way that the others are created. Sprites are addressed by numbers (Sprite 29, for example). Each sprite needs attributes of Color (from a palette of 16), Speed, and Heading. As the user enters these values on the keyboard, the designated sprite responds to the command.

The LOGO screen mimics the board of the Scrabble game with 31 (across) by 23 (down) character positions. LOGO has 256 types of TILES to which each is assigned a character, number or punctuation symbol, etc. To position a character, the user types PUTTILE and a code number (for standard characters, same as the ASCII code) followed by the X, Y coordinates of the desired location.

To modify a standard character (change a 7 to a 7, for example) or create an entirely new character, the user enters the MakeChar command. The monitor produces an enlarged "blank" tile in the form of an 8x6 grid. Users can design new characters on the grid in the same way that they created designs on the original 16x16 grid. The new character is assigned its own code and stored in memory. The TI-99/4A has room for a total of 256 tiles in memory, all of them colorable from the palette.

Programming With LOGO

These are all examples of what BASIC programmers would call direct statements. With LOGO, multicommand jobs can be called up with a single word. Suppose a user wants to draw a box in several places as part of a graphics scene. This would require the creation of a program, or procedure in LOGO parlance, by typing **To Box**. Then, on succeeding lines (with no line numbers needed), the user types in the Forward and Right commands to draw a square as outlined earlier. From then on, whenever a box is needed, the user types **Tell Turtle Box**.

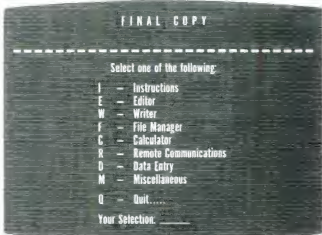
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You'll learn it in a few days. You'll use it for years.

Procedures can incorporate sprites and tiles too. For example, the following procedure will create a red ball and make it trace a square at a speed of 10 velocity units every time Square is typed into the computer:

```
TO SQUARE
TELL SPRITE 1
CARRY :BALL
SETCOLOR :RED
HOME
SETSPD 10
REPEAT 4 [WAIT 30 RIGHT 90]
SETSPD 0
END
```

From the home position, the ball-carrying sprite moves north at a speed of 10 for a duration (Wait) of 30 units, at which point it makes an immediate right angle turn. The two-step sequence is repeated four times, followed by a command to stop (Set-speed 0). If the last Set-speed command were missing, the ball would continue moving north forever, wrapping around to the bottom of the screen.

Procedures can also contain subprocedures (subroutines) that act as building blocks for a much larger procedure. The language is intelligent enough to allow the creator to work on any subprocedure at any time in any order, with total disregard for such orderly concerns as line numbers.

Plain English descriptors bring subprocedures together easily. For example, if the user has written subprocedures called Dots and Dashes that make the computer

produce short and long beeps respectively, he or she can create procedures linking those dots and dashes in proper Morse Code sequence, calling each sequence by the corresponding alphabet letter (To A, To B, etc.). By bringing letters together as follows, the user will hear a standard Morse rescue signal whenever SOS is typed into the computer.

```
TO SOS
S
O
S
END
```

More advanced features in TI-LOGO take the student into the understanding of X and Y coordinates and what BASIC programmers call conditional branching. In TI-LOGO, a procedure can test for a given condition and jump to subprocedures based on If (if true) and If (if false) results.

It may seem that many of the commands require numerous keystrokes. Fortunately, there are 29 two-letter, short-form commands. Clearscreen can also be accomplished with CS, Setheading with SH, etc. As with any computer program, LOGO procedures can be saved on cassette or disk for recall at a later time. The user can also save libraries of special shapes and tiles. TI-LOGO accomplishes Save and Recall functions with the help of screen prompts.

That LOGO is a sophisticated, intelligent language can be confirmed by the de-

mands it puts on computer memory. All three microcomputers to which LOGO has been adapted require 48K RAM. For the TI, LOGO is largely contained in a plug-in ROM cartridge.

Error messages further reveal the language's intelligence and reluctance to frighten the student. In fact, in TI-LOGO, the word error doesn't even appear. Instead, mistakes are met by helpful messages like Can't (the computer is unable to perform an operation logically), Tell Me More (the computer needs a number or variable to carry out the command), and Then Is Out Of Place (in an If...Then...Else command, Then is out of place).

Microcomputer users who have experience in programming will be charmed by the simplicity and enormous power of LOGO. It is the kind of tool one wishes was available for learning math, geometry, and computer science as a child because it invites the user to experiment and discover. Those who have never touched a computer keyboard will find that LOGO is a painless way to learn or refresh many concepts at once.

/PC

For more of Seymour Papert's theories, four of his published papers are gathered in *The Computer in the School* Tutor, Tool, Tutee, edited by Robert P. Taylor (Teachers College Press, 1980). Contact Teachers College Press, c/o Columbia University, 81 Adams Dr., Totowa, NJ 07512.



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Instructional programming for the PC transforms learning into an imaginative, entertaining educational experience.

EDUCATIONAL SOFTWARE For The PC

Teamed with the right software, personal computers can be excellent instructional tools. The IBM PC, with its color, graphics, and sound capabilities is especially well-suited to this purpose and has inspired the publication of a number of educational programs.

New programs arrive on the market every month. The 16 programs reviewed in this article constitute a comprehensive sampling of educational software available for the PC. Educational software can be divided into three broad categories: general instructional, educational games, and systems or applications training. Each program reviewed was placed in one of the categories and then measured by five criteria: effectiveness, efficiency, documentation, appeal, and use of the PC.

To be effective, a program must define its educational goals at the outset, either in the documentation or on the disk. It should demonstrate good organization, use relevant examples and practice exercises, and provide feedback to the user. An effective, well-designed program establishes its target group by age, background, and level of expertise. If the program underestimates the ability of users it is aimed at, or if it is overambitious, it will not be effective. A misdirected program is a poor teacher.

Efficient software is accurate and easy to use. Nothing destroys a user's resolve as quickly as a program that's difficult to use,

or worse, one that won't run without self-generated errors. Software should move easily from display to display and lesson to lesson, and give the user some control over the sequence of exercises.

Good documentation cannot save a bad program, but bad documentation can ruin a good one. Some software publishers still do not realize this. Good documentation is comprehensive, well organized, and written in clear, simple English rather than computerese. Programs listed in this review were rated lower if they failed to include system configuration and start-up procedure.

An efficient, well-documented program is worthless if no one likes to use it. One way to assure appeal is to design the program to be interactive, allowing users to exert some control over the learning process. Audio-visual features also contribute to a program's appeal. If the display gives the user headaches, the program is a failure, even if everything else rates high. Legibility and organization of the display, interesting graphics, appropriate sound effects, and overall packaging also contribute to a program's appeal.

The last criterion is the use of the PC. Does the program exhibit strong compatibility? Does it make imaginative use of the PC's capabilities, including sound, graphics, function keys, and systems software?

COMPUTER DISCOVERY

Science Research Associates (SRA)
155 N. Wacker Dr.
Chicago, IL 60606
(800) 621-0664

List Price: \$200

Requires: 64K, one disk drive,

color/graphics adapter

Age-group: 12 to 18

Computer Discovery comes in two versions: one for junior high school students and one for high school students. The objective of both programs is to introduce basic computer concepts, including logical analysis, programming, applications, and the history of computers.

Contrary to what many novices may think, computer science is more than learning how to program. Technically competent coders may be able to produce reams of adequate code, but getting the most out of a computer requires a firm grounding in all the aspects of computer science covered in this program.

Computer Discovery has a lot more going for it than thoroughness, however; it is a pleasure to use. The program is visually appealing, makes good use of both color and graphics, and presents the course material in imaginative, interesting ways. The software and accompany-

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ing workbook are well integrated and the practice items maintain the student's interest. All of these features mean that users are more likely to understand and remember the material.

Computer Discovery is one of the best introductions to computer science. The complete program takes 15 to 30 hours to complete but requires no previous knowledge of computers. The instructor's guide comes with learning objectives, potential projects, and a key to workbook assignments. The price includes 20 student workbooks, a teacher's guide, and two disks.

Computer Discovery does have a few minor glitches. When students complete an exercise, for example, they must return to the main menu before going on to the next exercise. While this may be a good idea initially, it becomes tedious. The function keys could have been used more effectively, and adding sound to the program might have spiced up the package. But these complaints do not detract from the fact that this well-planned, well-packaged program is one of the best educational products on the market.

THE SPEED READER

Davidson & Associates
6069 Groveoak Pl. #14
Rancho Palos Verdes, CA 90274
(213) 378-7826

List Price: \$74.95

Requires: 64K, two disk drives

Age-group: 10 to adult

Speed Reader teaches students to read faster and with greater comprehension. It combines excellent graphics and sound effects to lead students through a variety of self-paced practice exercises that offer immediate feedback in both speed and accuracy.

The documentation clearly outlines the general principles of speed reading and offers a few exercises to illustrate each example. The program consists of four parts or lessons: letters and words, eye movement, reading columns, and reading passages. The only problem with the documentation is that it lacks detail when it describes the initial setup.

Speed Reader is a practical program that systematically enhances reading skill. Increasing reading speed is a bene-

fit for users who want to keep pace with today's expanding information world.

TYPING TUTOR

IBM Corporation
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
List Price: \$24.95
Requires: 48K, one disk drive
Age-group: 16 to adult

Typing Tutor emphasizes accuracy over speed. This program teaches the letters, numbers, and special functions of the PC keyboard. The program's strength lies in its linear agenda, a step-by-step series of practice exercises. It also includes a feature, dubbed the Time Response Monitor, that helps evaluate the student's progress by keeping track of speed and accuracy, as well as introducing additional keys when typing speed reaches 30 wpm.

Typing Tutor allows teachers to monitor up to 39 students. The program assumes that the teacher will develop and

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input typing tests, since none are included in the program. This characteristic has one advantage: the teacher can individualize tests for each class.

The program has a few curious omissions. The otherwise excellent documentation covers finger reach to the home keys only. The user must figure out the proper way to reach the other keys. Typing Tutor's menu is not very flexible; it ignores the function keys. But even with this flaw, Typing Tutor is a useful tool for users who are new to the PC keyboard.

VOCAB TEACHER

The Moonware Company
39 Sylvan Ln.
Weston, MA 02193
(617) 237-4434
List Price: \$25

Requires: 64K, one disk drive
Age-group: 6 to adult

Vocab Teacher is not an ordinary vocabulary builder. This program allows teachers to create their own instructional units. It offers five basic options to facilitate lesson planning: begin a session, create a lesson, erase a lesson, and create a special character set.

Using these resources, a teacher who has no previous experience can set 100 drill and practice sessions on various subjects; the answer and question structure is not limited to language skills.

Vocab Teacher does an excellent job

of implementing the drill and practice format. However, as a general authoring system, the program lacks versatility. Students must follow the order of drills selected by the teacher. The program can assist the student, but the instructional path of a lesson cannot be changed.

The program uses some function keys and alternate character sets. Use of the color monitor is not advised, as it results in poor display quality. This is a shortcoming; educational software should be able to support both monochrome and color monitors. Considering its modest price, Vocab Teacher is a practical classroom resource.

Educational Games

ARITHMETIC GAMES SET 1

Science Research Associates [SRA]
155 N. Wacker Dr.
Chicago, IL 60606
(800) 621-0664
List Price: \$65

Requires: 64K, one disk drive,
color/graphics adapter
Age-group: 10 to adult

Arithmetic is a subject that is difficult to make appealing, but Arithmetic Games Set 1 manages to do just that. It employs a competitive game format that provides practice in the four basic arithmetic

skills: addition, subtraction, multiplication, and division. The program includes two games; both make good use of the PC's graphics and sound capabilities.

Users play Beano, a variation of bingo, by performing arithmetic on the two or three numbers rolled by computerized dice. Rockets uses a 15x15 grid on which students practice skills while moving a spaceship around the board. Both games allow individual students to compete against the computer or two students to compete.

The only thing that kept this program from scoring straight A's was the inadequate documentation. It does not include clearly explained objectives and fails to give good examples. Although it has its shortcomings, Arithmetic Games Set 1 is a fun and instructive program.

ARITHMETIC GAMES SET 2

Science Research Associates [SRA]
155 N. Wacker Dr.
Chicago, IL 60606
(800) 621-0664
List Price: \$65

Requires: 64K, one disk drive,
color/graphics adapter
Age-group: 10 to 16

Like its predecessor, Arithmetic Games Set 2 livens up the drudgery of practicing the four basic arithmetic functions. The games in this set are dubbed *Discovery Machine* and *Number Chase*. The first



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shows a pair of numbers and a solution. The player tries to guess which arithmetic function was applied. In the second game, players try to determine a secret number from numerical information provided by the program.

Arithmetic Comes Set 2 is highly interactive and makes good use of sound and graphics. Its sole weakness is inadequate documentation. Overall, it's an imaginative program that can take much of the pain out of learning arithmetic.

MATH DRILLS I

Starware

1701 K St. NW #801

Washington, DC 20006

(202) 466-7351

List Price: \$25

Requires: 64K, one disk drive

Age-group: 6 to 16

Does the *I* in the program title *Moth Drills I* mean that this program has only one thing going for it? Perhaps, because the only good part about the program is that it is easy to use.

Documentation is minimal; it doesn't include hardware requirements, a program explanation, or a lesson description. For all practical purposes, the documentation stops at "insert the disk." Neither the packaging nor the program content are particularly appealing, the graphics are simple, and use of color is almost nonexistent. In short, the program fails to avail itself of many of the PC's unique advantages. Other arithmetic programs will more effectively suit the user's needs.

QUESTION

Alpha Software Corp.

12 New England Executive Park

Burlington, MA 01803

(617) 229-2924

List Price: \$45

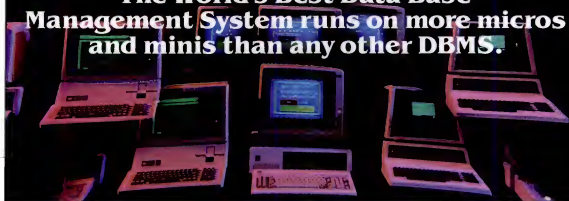
Requires: 64K, one disk drive, color

monitor, dot matrix printer

Age-group: 8 to 18

Question uses an entertaining format to provide players with practice in remembering facts about various categories, such as cities, animals, and famous people. The player thinks of an item from listed topics, and the computer tries to

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AUDIO-VISUAL features contribute to a program's appeal.

guess the item by asking questions. The program also allows users to design their own programs.

Question features an extensive data base that includes almost 200 animal names. The program's response time is fast and the documentation is thorough and concise. Part of the introductory information comes on an audiocassette tape, an innovation unique among the programs reviewed.

Question makes good use of the PC's capabilities. It has imaginative graphics and sensible keyboard commands.

T.E.L.

Computricks, Inc.
533 Fifth St.
Santa Rosa, CA 95401
(707) 542-5335
List Price: \$40

Requires: 64K, two disk drives,
color/graphics adapter
Age-group: 8 to 16

T.E.L. (Teach, Enjoy, Learn) is a variation of 20 Questions. The program prompts users to ask questions about various categories such as "cities of the world." Students learn to make relevant inquiries about distinguishing features such as location, population, geography, and city government.

The program is easy to use but suffers from omissions, design flaws, and poor documentation. The manual needs more examples of the program's capabilities and procedures. The data base is so small that users are compelled to create their own. Compared with other software in this category, the packaging, screen quality, and use of sound are inadequate. Graphics are nonexistent.

T.E.L.'s use of the PC's capabilities is, in short, primitive. Alpha Software's Question would be a better choice for users interested in this kind of educational gameware.

SNOOPER TROOPS: THE DISAPPEARING DOLPHIN

Spinnaker Software
215 First St.
Cambridge, MA 02142
(617) 868-4700
List Price: \$44.95

Requires: 64K, one disk drive,
color/graphics adapter
Age-group: 10 to adult

Snooper Troops challenges players to solve the mystery of "Who stole the dolphin?" Players must collect clues as the program proceeds and store the information in an accompanying booklet. The program makes imaginative use of this format to provide practice in note-taking, organizing information, and reasoning.

Players collect clues by traveling over a simulated landscape, stopping at various residences to ask questions, entering buildings to photograph evidence, making telephone calls at designated times, and collecting messages. This is not a short game: playing time averages 12 hours. Fortunately, the designers have made provisions for players to log off and reenter the game at the same point.

Players won't stay away for too long—this program is just too enticing. With its clear and well-packaged documentation, complemented by excellent graphics, color, sound, and an imaginative story line, Snooper Troops is the game against which other educational games must be judged.

WORD CHALLENGE

Proximity Devices Corporation
3511 N.E. 22nd Ave.
Ft. Lauderdale, FL 33308
(305) 565-2188
List Price: \$39.95

Requires: 64K, one disk drive
Age-group: 10 to adult

Word Challenge, a spelling game similar to the popular game Boggle, asks the user to find as many words as possible in a square with 9, 18, or 25 boxes. Each box provides a clue by revealing one letter at the game's outset. Users play against the computer and score one point for each word identified. The computer also

earns one point for each correct identification. Players are given the opportunity to verify the spelling of their choices.

Word Challenge achieves a high level of interactivity and offers many clear examples. The most impressive feature of the game is the size of its vocabulary; it packs close to 90,000 words in its lexicon. These attributes tend to keep the user's interest despite the below-average screen display and limited use of sound (an occasional beep). The documentation does not provide detailed procedures for setting up the program. However, Word Challenge is an entertaining and effective tool for practicing word identification and spelling.

Systems and Applications Training

ATI POWER FOR IBM PC-DOS

America Training International
3800 Highland Ave. #300
Manhattan Beach, CA 90266
(213) 546-4725
List Price: \$75

Requires: 64K, one disk drive
Age-group: 16 to adult

ATI Power is designed to teach students how to use PC-DOS commands. It covers the basic steps necessary to fire up the system, monitor available space, and perform certain maintenance operations. The DOS commands covered are: DIR, ERASE, TYPE, RENAME, COPY, BATCH, CHKDSK, EDLIN, DISCOPY, DISKCOMP, FORMAT, and SYS. The manual includes a troubleshooting guide that shows common error messages and remedies.

ATI Power could be improved by the inclusion of a Help option. Other than that, the program is easy to use, and allows the student to select either a tutorial or a review of specific commands. The documentation lacks a discussion of system configuration but is otherwise excellent. ATI Power could make better use of graphics and would also benefit from better packaging.

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To place a listing in the new directory, call **PC's Directory Department** at **212-725-4215**. Listings cost \$125 per issue.

This is a fairly good tutorial simulation of PC-DOS for the first-time user and is recommended for novices who wish to unravel the mysteries of PC-DOS.

BBASIC

Computrickx, Inc.
533 Fifth St.
Santa Rosa, CA 95401
(707) 542-5335
List Price: \$130

Requires: 64K, one disk drive, BASICA, color/graphics adapter
Age-group: 16 to adult

BBASIC uses a simplified version of BASIC to introduce students to programming. It makes BASIC less overwhelming by breaking it down into 13 units. Besides an introduction, it includes lessons on immediate and deferred modes, disk manipulations, variables and input, branching and loops, simple graphics, subscripted variables, flow charting, conditional branching, subroutines, arrays, nested loops, and debugging.

The screen gets crowded at times, and the program's flashing messages can become annoying. In most respects, however, BBASIC makes use of appealing graphics that engage the user. The documentation provides most of the necessary information, but users will need to supplement it with reference books. Novices will probably find BBASIC useful and informative.

D.B. POWER

American Training International
3800 Highland Ave. #300
Manhattan Beach, CA 90266
(213) 546-4725
List Price: \$75

Requires: 64K, one disk drive
Age-group: 16 to adult

D.B. Power professes to give an introductory education to dBase II. Unfortunately, it's hardly up to the task. This program simply does not have enough content for the price. Considering that prospective students are first-time users of a data base, D.B. Power lacks adequate examples in the various categories. For instance, it demonstrates how to sort via ZIP codes, an easy sort routine. It stops

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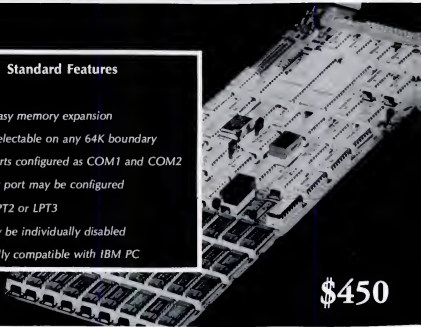
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TEAMED WITH the right software, personal computers can be excellent instructional tools.

short there, without even mentioning the other descriptors one might use for sorting. The program claims that "the power of a data base management system is that it allows you to organize information." This is a reasonable statement, but it would also seem reasonable to include more than one example of ways to accomplish this task.

D.B. Power has problems wherever you turn. To proceed from one segment or operation to the next requires returning to DOS and logging on—a rather silly and arduous procedure for a program of this type. The documentation discusses the cause of various errors, but it neglects to mention how to correct them. It also fails to describe the system configuration or to provide a useful list of dBase II applications.

The screen output, lacking both color and graphics, is a disappointment. It displays text only. The program does not use the cursor or the function keys, although they would seem to be particularly appropriate for this purpose.

THE INSTRUCTOR

Individual Software, Inc.
24 Splnknaker Pl.
Redwood City, CA 94065
(415) 591-4166
List Price: \$39.95
Requires: 64K, one disk drive
Age-group: 14 to adult

The *Instructor* is the best software-format introduction to the PC around. It allows users to interact freely with the computer while presenting them with many good examples and practice exercises. In just a few hours newcomers can feel comfortable and familiar with the PC, confident of their ability to use a new tool.

The *Instructor's* use of color, sound, and screen organization provides appealing and effective lessons. One minor glitch: The color version is difficult to read with the monochrome display. The documentation package is superb—one of the best in the business. It is very well integrated with the software. The mix between disk and documentation is just right. The incorporation of a dictionary and reference aid in the software contributes to this excellent program's ease of use.

KEYBOARD

Computrickx, Inc.
533 Fifth St.
Santa Rosa, CA 95401
(707) 542-5335
List Price: \$40
Requires: 64K, one disk drive,
color/graphics adapter
Age-group: 16 to adult

Keyboard is a very limited program. It attempts to teach users more than they ever wanted to know about the PC keyboard by presenting a step-by-step introduction to each key, an example of its application, and a practice drill. If this sounds a little boring, it is. Though easy to use, the program forces the student to proceed in lock-step through the entire program. Better use of graphics would have helped, as would the use of color, sound, or the function keys. The graphics that are presented are clear, but they don't save the program.

MENU-POWER

American Training International
3800 Highland Ave. #300
Manhattan Beach, CA 90266
(213) 546-4725
List Price: \$49
Requires: 64K, one disk drive
Age-group: 16 to adult

Menu-Power is an excellent introduction to WordStar for the newcomer who wants to plunge right in with hands-on experience. The program is very easy to use and offers plenty of good examples and practice exercises. It is also flexible; the user has the option of either following a programmed introduction or using

a menu to pick and choose among the eight lessons.

Menu-Power has a few problems. Screen quality is poor to the point of being confusing. The screen tends to become cluttered with text. It is sometimes hard to tell whose menu—WordStar's or Menu-Power's—is being shown. And it lacks an easy method of selecting menu options. The documentation, which is otherwise clearly written, neglects to clarify the correct system configuration.

Menu-Power nonetheless offers a good, quick introduction to WordStar. It lacks lessons on some of WordStar's more sophisticated commands (centering, chaining, print options, scrolling), but according to the manufacturer, these will be available on an advanced program called Command Power. Buyers should evaluate their own requirements to determine which of the two packages best suits their needs.

PC TUTOR

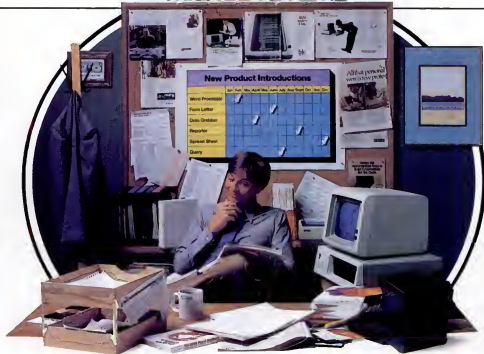
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P.O. Box 90833
Los Angeles, CA 90009
(213) 370-6355
List Price: \$79.95
Requires: 64K, two disk drives
Age-group: 16 to adult

PC Tutor attempts to familiarize novices with the IBM PC. Because its objective is appropriately modest, it generally succeeds. It makes good use of graphics, color, and the function keys to take the student through a number of topics, including computer concepts, disks, files and devices, and DOS commands. It also introduces advanced topics such as sophisticated commands.

With its solid documentation, PC Tutor should satisfy most first-time users who strive to become familiar with the PC in a painless manner. **/PC**

In 1978, Ronald Axtell and Richard Wolker received doctorates in instructional psychology from Brigham Young University in Provo, Utah. Currently, both serve as adjunct faculty members at Notional University in San Diego. Axtell is also a project area manager at Courseware, Inc.; Wolker is director of the Electronic Publishing Group and a senior technical advisor at the same company.

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Requires: 64K, one disk drive
Age-group: 8 to adult
Number of Players: One

What do you do when your cousin Clarence from Kalamazoo wants to see what your new PC system can do; your spouse, tired of losing you to the computer, wants to join in the fun; or your 10-year-old, who has a computer in school, wants to learn all about it? FriendlySoft, Inc., of Texas has come up with an answer: *Friendly Wore—PC Introductory Set*. For \$49.95 you get three disks containing three personal finance and 27 game programs and a well-prepared reference book.

From Games to Personal Finance

The first disk contains a program called *Introduction to the PC*. Since it is presented as a story, you need do nothing more than read the displays to understand what computers are all about. The disk also includes a novel vision and hearing test program and six good games: *Mostermind*, *Nevodo Dice*, *Seo-Bottle*, *Hongmon*, *Tic-toc-toe*, and *Killer Moze* (a three-dimensional game challenging enough to drive anybody insane).

The second disk features ten more games, from *Blockjock* to *Othello* and *Golf*. It also includes a personal biorhythms program and a program to aid in predicting the outcome of sports events based on biorhythms.

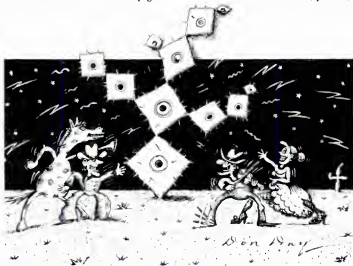
The final disk contains personal fi-

nance and business simulation programs. *Check Register*, a personal finance program, is an excellent tool for help in maintaining a checkbook. Similar analytical programs include the calculation of Present and/or Future Value, Break Even Analysis, and Amortization Analysis. The *Business Simulation* program takes you through all of the terminology and transactions necessary for keeping a set of accounting documents. If you are unfamiliar with accounting, this program will provide an excellent introduction to the basics.

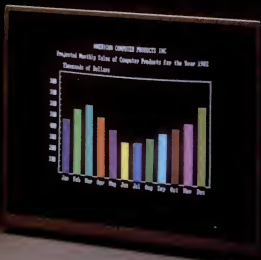
The reference book was intentionally prepared by someone who was unfamiliar with computers before being exposed to the programs on the *Friendly Wore* disk. Consequently, the instructions for doing such things as backing up the disk are extremely well written and leave no questions even for the novice. Several pages of

the manual are devoted to "A Little History," a brief but interesting overview of the history of computers. There is also a discussion on the IBM Personal Computer, operating systems, memory and storage, languages, and disk organization. A short section subtitled "Anatomy of a Program—Inside Mastermind" gives a detailed explanation of sections of the program. This is done in terms everyone can understand.

The programs are user-friendly and self-prompting with built-in instructions. If you give a wrong command when using the software, for example, the program clearly tells you what to do. Because of such clarity, little printed material is required to explain the programs. A few simple paragraphs describe how each program works and some of the assumptions made, such as in *Nevodo Dice*. The whole manual is contained in a small, padded,



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Use of Graphics

These programs have to be seen to be appreciated; they have fantastic graphics, all done on the monochrome display. A color graphics card is not required. Excellent graphics representations are achieved by using character graphics with various attributes such as reverse video.

General Appeal

The games on both the first and second disks are excellent, and the finance pro-

ONE PERSON
*claims that with
the Check Register
program he was able
to uncover the
source of an error
in his checkbook that
had plagued him
for months.*

grams are instructive and helpful. One person claims that with the Check Register program he was able to uncover the source of an error in his checkbook that had plagued him for months. Both fun and interesting, these programs deliver all they promise.

The only disappointment with this package is that there is no warranty if the programs prove defective. The risk is entirely the user's.

Getting Your Money's Worth

Introductory Set is not one of those disappointing packages advertised as "100 Basic Programs for \$1.00 Each"; it is highly recommended and sure to please. The only surprise is that it doesn't cost more than it does. /PC

Arlene J. Berlin recently turned on 8-year hobby in microcomputing into a career. Her company, Software 'n Stuff, in Dallas, Texas, sells software strictly for the IBM PC.

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The Federal Reserve Bank offers on-line services to banks in nine Western states and provides PCs to participants.

FedLine: The Bankers' Bank Installs The PC

By January 1983, at least 100 financial institutions in the Western United States will be using FedLine, a new service offered by the 12th District of the Federal Reserve Bank (commonly called the Fed). Each of those institutions will be using an IBM PC to "talk" to the Fed.

FedLine is designed specifically for small- and medium-sized banks, savings and loans, and credit unions—institutions that previously lacked the computing power or the volume of transactions to justify going on-line with the Federal Reserve Bank. Now these more modest financial institutions can communicate with the Fed's mainframe computers as the big banks have been doing for years.

The FedLine service would be a significant development in banking even without its most innovative feature—the IBM PC. In a notable departure from the conservative behavior that has been the hallmark of the Federal Reserve Bank, this institution has bought dozens of PCs and is leasing them to FedLine participants at the impressively low cost of \$175 per month. Even more impressive, per-

haps, is that the Fed has invited all its FedLine customers to use their PCs as they please whenever they're not on-line.

Alternative Access

John F. Hoover, vice president of Financial Services for the Fed's 12th Dis-

THE FED
has bought dozens of
PCs and is leasing
them to FedLine
participants.

trict, explains the program this way: "We wanted to design inexpensive, alternative access for small- and medium-sized banks so that we could give them the same services as the larger banks do with their computers or direct-line terminals. After looking at a number of possibilities, from

dumb terminals to small micros, we decided on the IBM PC."

Before FedLine came along, financial institutions had three options for transacting business with the Fed: communicating through their own mainframe computers; renting a dedicated terminal and special data line (for \$600 to \$700 per month); or using an off-line means of communication—the telephone or Telex—to contact the Fed's wire room, where Federal Reserve staffers would execute the transaction. With the addition of FedLine and the PC network, access to the Fed's services is more attractive for small banks.

As Hoover notes, "The first application we're going to have on this is wire transfer. Our typical customers have about 20 to 30 wire transfers a day. The break-even point for them in computing our off-line transaction cost versus our on-line cost is about four to five transfers a day. So it's really

John F. Hoover, (right) vice-president of the Financial Services for the Federal Reserve Bank's 12th district.



cost-effective." Considering that the off-line charge for a transfer is at least \$4.75 and that the on-line cost for the same service is only 65¢, it's easy to see how the savings in transfer charges would quickly offset the \$175 per month to lease the PC.

The Banking Marketplace

Obviously the FedLine service is good for participants, but it's also very good for the Fed. The program was developed as one response to the Monetary Control Act

FEDLINE and its low-cost PC could bring many small institutions into the Fed's fold.

of 1980, which opened access to the Federal Reserve Bank's services to any financial institution that accepts deposits. This law added savings and loans and credit unions to the base of potential customers for the Fed. In the 12th District (California, Oregon, Washington, Nevada, Utah, Idaho, Arizona, Alaska, and Hawaii), this group includes more than 4,000 institutions, most of which had previously found other ways of obtaining the same services now available to them from the Fed.

In the past the Fed's services were free for members, but membership was costly; in fact, until the 1980 law went into effect, fewer than 150 banks in the Western District were Federal Reserve members. Now the Fed is allowed to charge a fee, comparable to what a private firm would charge, for each service. So the Federal Reserve Bank needs customers—small and large—to operate cost-effectively itself. FedLine and its low-cost PC could bring many small institutions into the Fed's fold rather than having these institutions pay large commercial banks to provide them with the same services.

So far, the institutions targeted for this service have responded enthusiastically. John Hoover recalls that when FedLine was in the testing stages during July and August, his staff took an informal survey to gauge interest in the project. "We asked around the district and, without doing any

marketing at all, found that we could easily sign up 200 customers by year's end. It's a product that almost sells itself, because when the PC is not accessing Fed services, a bank can use it for a lot of other things."

FedLine officially began taking on customers in mid-September. Hoover planned to start out conservatively: "Because of the interface with a new computer, we wanted to take it a little bit easy, to make sure we did it right. So we're looking at having 100 institutions interfaced with us by the new year."

FedLine Services

At present the participating institutions can use FedLine to transfer funds to and from their own accounts with the Federal Reserve Bank and to send or receive funds from another participating institution. One advantage of using a microcomputer for this is that the transactions are quick. Another advantage is that participants can produce both electronic and printed records of their transactions instantly.

In the future FedLine will offer expanded services. These include on-line cash ordering (something that no bank, large or small, can do now; it must phone or send a letter to order cash), transactions of government securities, exchanges of economic information, and implementation of an administrative message system. The Fed also hopes to use FedLine to receive the statistical reports that all banks are required by law to file.

The PC-Mainframe Connection

In strictly business terms, FedLine is unusual for its effort to attract customers, a role that's new to the Federal Reserve Bank. A key part of the attraction, of course, is the PC. Its integration into the Fed's communications network is a pioneering effort. The FedLine's communications link was created when the PC was brand new. This is the first service to use PCs for such a far-flung group of users.

The two programmers who charted this unknown territory by interfacing the PC with the Fed's mainframe system are John Hsiao and Dave Smith, under the direction of Charles Barry. "The original concept was a low-cost terminal," says Smith. "We thought that the age of the microprocessor as a tool had really arrived, so when the IBM came out, we ordered some."

Two of the first PCs arrived at the Fed's San Francisco computer center in November 1981, when Hsiao and Smith went to work with them. Hsiao had extensive mainframe programming experience but did not know BASIC, the principal language available for the PC at the time. According to Smith, Hsiao "read the BASIC manual. As soon as he got to the last page, he started programming in BASIC." Smith became the Fed's resident micro expert because he already had a micro.

The two men divided up the work of writing a complex program that would allow PCs to communicate with one of the

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When a bank, savings and loan, or credit union joins FedLine, it receives a complete PC system. Such a system includes the PC with 128K of RAM, a printer card, and an asynchronous communications adapter, the monochrome display, two double-sided disk drives, the IBM dot matrix printer, and a Novation 1200 baud modem. The software includes PC-DOS and the custom-designed FedLine program.

The monthly cost of leasing the PC system is \$175, which includes a service contract. The Federal Reserve Bank purchases the PCs from ComputerLand of

San Francisco, which also provides service. Computer experts from the Fed's staff install the PC at the site of each member institution.

Participating institutions are encouraged to use the PC for internal computing tasks such as financial forecasting, accounting, and word processing. FedLine support staff will evaluate commercial programs and assist participants in choosing software that is appropriate to their needs. Member institutions may upgrade their PCs at their own cost.

—J.J.H.

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Fed's mainframes, provide multiple levels of security, and offer clear, easy-to-use instructions to the staffs of participating financial institutions. They wrote most of this program in BASIC (which should encourage everyone who's still learning to program), adding a few subroutines in assembly language. "This combination of elements had an unexpected result," Smith notes.

IBM DIDN'T
have the expertise to
answer our questions
because we were
going into an area
nobody had tried.

"When we wrote some subroutines in assembly language, we committed ourselves to interpretive BASIC, although we didn't know it at the time. When the compiled BASIC came out, we found that the coordination, the linking, with the assembly routines uses a different structure for strings. So without a lot of reprogramming, we couldn't adapt the program to compiled BASIC simply because compiled BASIC wasn't available when we started."

Plowing New Ground

Much of the programming involved that sort of learn-as-you-go technique, the men point out. "The manual from IBM doesn't give a lot of the information we needed," Hsiao says, "and IBM didn't have the expertise to answer our questions because we were going into an area nobody had tried. So we just went in ourselves."

Over the course of this 6-month project, Smith and Hsiao ran into surprisingly few roadblocks. Their biggest challenge was getting the host computer, a 370 series IBM mainframe, to acknowledge the PC's signals. As Smith puts it, "I remember there was at least a month when we were trying real hard to communicate with the host. When we finally got through and got the host to acknowledge what we were saying, it was like a holiday."

If 6 months of full-time work by two

programmers—and a month just trying to get the mainframe to send a greeting—seems like a long time, consider the result: a program that fills 95 percent of a single-sided PC disk, or about 150K of RAM. Because of its size, the FedLine program is divided into a number of separate modules. Still, a PC must have at least 128K to run it.

The FedLine Vanguard

As FedLine prepares to add services, Hsiao and Smith will participate in the research and planning to implement them. "Anything that we could conceivably stretch to be applicable to this, we'll try out," Smith predicts. "One of the first things we're looking at is electrically alterable ROM to keep certain information that cuts across applications boundaries in nonvolatile storage on the PC."

Smith also plans to use compiled BASIC for some of his future programming. "We believe that compiled BASIC is one good way to go because you get stuff that's almost as efficient as assembly language and is very easy to program, very easy to change."

Both Hsiao and Smith are pleased with their programming achievement for FedLine and both have developed a particular respect for the PC. Smith sums it up well: "Our experience with the PC was good. The PC is a powerful micro and we're impressed with its capabilities."

FedLine is now in its fourth month of operation in the nine Western states. Several other districts in the Federal Reserve system are studying the project and the PC. The Dallas district is using the PC for some operations, and offices in St. Louis, Minneapolis, Kansas City, and Atlanta are evaluating both the PC and the FedLine software.

If the 12th District's experience is any guide, FedLine is likely to be popular with financial institutions throughout the nation. The Fed's John Hoover observes that more institutions are interested in the service than the project can accommodate now. "The problem we're having, frankly, is keeping up with the demand." /PC

For more information about FedLine, contact Financial Services, Federal Reserve Bank of San Francisco, 101 Market St., San Francisco, CA 94105, (415) 544-2127.

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Recess Is Over

A PC in every classroom? Possibly. The time may finally be right for computers to make the breakthrough.

Since at least the mid-1960s, reporters, educators, and computer programmers have been predicting the imminent arrival of the computer age in American schools. It's one of those all too familiar stories, such as "Killer Bees Moving North" or "Earthquake Prediction Rumbles Closer," that recurs as regularly as the winter solstice. More than one publishing and computer company has squandered half a corporate fortune in preparation for the great day, only to discover that it has acted prematurely.

DEMAND FOR computer training is so great that workshops fill as soon as they're announced.

The oracles are stirring again. This time their forecasts, which are generally shorter term and more modest than earlier predictions, may deserve attention. The big difference is the relatively inexpensive, user-friendly, durable, and adaptable microcomputer. This and recent developments in California suggest that 1983 may turn out to be a promising year for computers in education.

One of those developments is the allocation of funds by the California Legislature to establish a statewide network of Teacher Education and Computer (TEC) Centers. The TEC Centers are designed to encourage and support greater use of computers in education. California funds them through its Investment in People program, a \$27.5 million effort to modern-



(Top) Robert Preston of National Semiconductor; (bottom) Henry D. Weiss of the Industry Education Council and Al Dutra of IBM.

ize elementary schools, community colleges, and universities.

A United Front

Planning teams from 15 statewide regions met this fall in San Jose for a state-sponsored TEC Institute. The convocation confirmed that computer education has widespread support from teachers and administrators, as well as from business and

government. David LeCompte of the Santa Clara County Office of Education reports that the demand for computer training is so great in his county that workshops fill as soon as they're announced. "We had to turn away a couple hundred teachers at Christmas time last year," he declares.

One might expect that Santa Clara County (Silicon Valley) teachers and administrators are enthusiastic and well in-



California Superintendent of Public Instruction Wilson Riles

formed about the prospect of computers in the classroom. But the prevailing attitude of California educators was summed up best by Dr. Ruth Gordon, a school official in remote Lassen County. "We may be in the mountains," she said, "but we want our children to have the same opportunities as any child anywhere in the state or country. You can't graduate children without the tools of the age—it's unfair. If our kids leave school without a knowledge of the microcomputer and what it can do, I think they'll be seriously hampered."

Business and industry also have a stake in computer education. Most observers expect private demand for programmers, word processors, and other trained personnel to grow. Both Governor Jerry Brown and State Superintendent of Public Schools Wilson Riles have made a direct connection between technological literacy and the growth of California's economy. In his 1982 State of the State address, Brown asserted that "the first prerequisite to maintaining California's leadership is technological literacy. That means that our schools must augment the 3Rs with the 3Cs—computing, calculating, and communicating—through technology."

In her opening remarks at the TEC Center Institute, Judy Hubner of the governor's office stated that the California Office of Economic Policy estimates that 50 percent of California's new jobs in this decade will be related to new technologies. She noted that "traditional industrial plants are closing down in various parts of the state, leaving workers unemployed and, without retraining, unemployable. At the same time, the new high-technology industries have pages of want ads listing job openings."

Speakers from IBM, Pacific Telephone

and Telegraph, Pacific Gas and Electric, National Semiconductor, Lockheed, and the Bank of America also addressed participants at the TEC Center Institute. Each confirmed his or her company's interest in computer education in the schools. As Al Dutra, a senior marketing representative for IBM, told educators, "There exists today in both large and small companies an environment in which individuals cannot perform their jobs without interacting with a computer system."

The TEC Centers are unusual in their explicit mandate to work closely with business and industry. The exact form of that interest will not become clear until the centers are in operation. Henry D. Weiss, the vice president of the Industry Education Council of California, told educators, "There are people, equipment, materials, and resources in the private sector that can assist the TEC Centers. The private sector is interested, but you'll have to make the first move."

The First Move

This year California passed Assembly Bill 3194, a state version of the proposed federal "Apple Bill." The new law provides a tax credit of 25 percent of the fair market value to companies donating computer equipment to California schools between January 1983 and June 1984. If passed, the "Apple Bill" would extend an as yet undetermined tax credit to donating companies on a nationwide basis.

Assembly Bill 3194 will increase the effectiveness of the TEC Centers by encouraging the donation of thousands of computers to schools that otherwise could not afford them. This infusion of computer hardware will not, however, guarantee that computers will be used in the class-

room.

Running and supporting computers requires money, even if the hardware is donated. Unfortunately, the money must come from school budgets, which are stretched just to pay for textbooks.

Schools also need technical assistance and teacher training. TEC Centers will help provide assistance by setting up demonstration centers where teachers can examine various microcomputers and receive training in the ways they can be utilized in teaching. Teachers will receive help in evaluating courseware and software and in selecting the materials that best meet their needs. The centers will provide technical assistance in planning and restructuring school programs to integrate computers into the instructional process. TEC Center training will also be available to administrators, community leaders, students, parents, and the general community.

When educators are faced with the decision to buy reading books on computer

LEAN BUDGETS do not encourage innovation.

equipment, computers become a luxury. When teachers struggle with classes of 30-plus students, a computer is just one more thing to track. Lean budgets do not encourage innovation.

The situation is not much better in other states. California is just an example of a national trend. The demand for computer education comes at a time when financial support of schools is at a low point. Everyone wants computers in the classroom, but the question is whether anyone wants them enough to pay for them. The federal government, other state education departments, and private industry will all be watching California to see if public enthusiasm translates into financial support.

/PC

For more information on TEC Centers, contact California State Department of Education, Educational Tech Unit, 721 Capitol Mall, Sacramento, CA 95814, (916) 322-5588.

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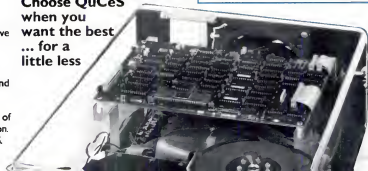
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SECT Demystifies The Microcomputer



Stephanie Burns, the force behind SECT, brings hi tech down to earth at the Computer Showcase Expo in New York City.

The Fall '82 Computer Showcase Expo, held at the Coliseum in New York City is a computer show like many others: Teenage video game junkies cluster around the PETs and Apples, techies with copies of *Robotics Age* in their back pockets cruise the aisles for the latest products, and salespeople proclaim that their booths are displaying the only hardware or software worth buying. None of these people speak English as you and I know it, but rather an alphanumeric dialect replete with references to RS-232 ports, 256K RAM, 8088 chips, and \$100 buses.

On the other side of this tech-talk gap is a guy we'll call Joe Showgoer. Joe thinks a serial port is a town that exports corn flakes and that RAM refers to someone born under the sign of Aries. He is interested in learning more about computers. If he could only cut through the jargon and the hard sell, he might even buy one.

Enter Stephanie Burns, president of SECT (Source of Educational Computer Training). Burns and members of her firm run continuous crash seminars for consumers during the 3-day show. Called the Small Computer College, the seminars

cost an extra admission fee and consist of two alternating 1½-hour courses: an introductory session called "What is a Personal Computer—How to Select the Right One for You" and a follow-up class on business applications. Together they add up to an Everything You Always Wanted to Know About Micros But Weren't Computer Literate Enough to Ask.

Burns' year-old company also runs regular classes on all phases of microcomputing and provides in-house instruction for companies that are computerizing. Burns is devoted to bringing the joys of the world into the information age... painlessly.

"We do a lot of attitude adjustment," she explains during a between-workshops break. "The number one block is the terminology, which prevents people from knowing how to begin to look at the indus-

try. Then there are the feelings that people have when they're forced to learn to use computers: "Am I going to lose my job? Will I understand how they work? Will I be bored?" What we're all about is helping people make that transition to computers."

Rudimentary Rap

On this particular day Burns is fine-tuning her standard rap for New York City audiences, who, she's finding, have "slightly different rhythms than the audiences in California. On the West Coast everybody would be sitting on the floor laughing. Here they seem to want it as fast as I can possibly give it to them—no humor." Audiences are asked to fill in evaluation cards after every workshop, and one Big Apple resident has actually requested that Burns be "less friendly." At the same time, the New Yorkers' rudimentary knowledge of computers strikes her as lagging behind the West Coast. She isn't sure they're getting it completely. Burns reprograms herself. She decides to begin the introductory seminar by asking people why they came. The answers vary: One man thinks he wants to learn about data processing; someone else is there to get a handle on teaching kids about computers; another can't figure out which machine to buy. One guy announces that he's a computer illiterate but wants to change.

"How many of you have heard at least one word out there," Burns gestures toward the display booths, "that you didn't understand?" Everyone looks sheepish. A few hands go up. "Okay," says Burns, "there's a myth that you need to be a mathematician to operate these magical, mystical machines. I want you to throw those ideas into the trash can."

Over the next 90 minutes Burns leads these new pilgrims through the electronic wilderness of input/output devices, disk storage, and circuit boards. Her speaking style is clear, concise, and friendly. Whenever possible, she compares the functions of a computer with something the audience is already familiar with, such as a digital watch.

While Burns makes it clear that she believes that computers are the future, she cushions future shock by pointing out that computers do five basic things: sort information, store it, perform calculations, input information, and spit it back out. She explains each function. Joe Showgoer is transformed into someone who no longer

thinks that if he touches a computer keyboard, it might explode in his hands.

The Chip Pitch

The next part of the lecture aims to help the audience sort through the manufacturers' claims. "Don't get caught up in the hardware sales pitch," she warns. With few exceptions, the different chips on the market "are Sugar Pops vs. Cap'n Crunch-

—not really all that different." In any case, assessing chip power is a crazy place for a novice to begin comparison shopping: "What I'd like you to do is approach this show a little bit differently than you have been. Put yourself and your business in the center—not all this hardware that you don't understand. You do understand your own business and your own needs. Ask the salespeople how to solve your problems."

Entech: Computer Skills Center

Adults now have a chance to catch up with the whiz kids.

When Maude and Philip Ackerman opened up the big gray and white cartons containing their new PC last year, they expected to be up, running, and VisiCalculating in 30 minutes. After all, the ads—"Gee, Dad, can I borrow the IBM tonight?"—had implied that operating a computer was child's play. Instead, the Ackermans spent the next few weeks in frantic consultation with their local ComputerLand dealer.

"I began to feel like someone who bothers his doctor with every little hang nail," recalls Mrs. Ackerman. "And then I would get really angry, because here I was spending \$6,000 and having made to feel like an idiot." The worst of it, according to Mr. Ackerman, were the alphabetized IBM hardware reference notebooks. "It was like trying to learn a foreign language by having someone hand you a dictionary. My background is in electronics design and my wife's background is in education, so we figured that if it was hard for us, it would be hard for almost everybody."

Their dealer estimated that 90 percent of his customers were having the same headaches. The Ackermans recognized a consumer need and decided to fill it. The result of their efforts is the Entech Computer Skills Center in Commack, New York. The center opened this September in an office building just outside a Long Island industrial park. It is close to those business people, lawyers, doctors, and dentists who the Ackermans feel, are most likely to be interested in computers, but who need fast, to-the-point instruction in business programs, not a semester-long college course in programming.

Most courses at the Entech Center

meet two to four times for several hours, on nights or weekends, and cost about \$175. An introductory class starts at what Mr. Ackerman calls "the level of which end of the floppy disk faces up when you put it in." There are also courses in WordStar, MailMerge, VisiCalc, SuperCalc, EasyWriter, Microsoft BASIC, and Pascal, as well as more general courses and special instruction in the use of modems and computer graphics. The teaching staff includes engineers, university computing instructors, and computer salespeople.

The center is heavily geared toward the PC, mainly because the Ackermans believe it's the best machine for business. (They do keep a few Apples and a DEC around for those who haven't yet seen the big blue light.) The Ackermans promise that their students will learn everything from how to take the PC out of the box to how to take the top off the central processing unit so they can get a good look at all those chips, ports, and expansion slots.

The Ackermans say that their students also include people who may not even need computers, or who might need different systems than the one they could (or did) buy out of ignorance. "We have no ax to grind because we don't work for ComputerLand or IBM," says Mrs. Ackerman. "We want to give people the tools to keep them from being rattle-dazzled by salespeople. It's hard holding, but there's need for it out there."

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She also discusses specific systems: "The IBM PC has one of the best-written manuals I've ever seen." A question-and-answer period follows, and the audience is sent away with some hard copy: a miniglossary of computer terms, a fact sheet on all the things computers can do, a how-to-buy checklist, and a recommended reading list beginning with Alvin Toffler's *The Third Wave*.

Nurturing a Business

Burns got into the micro business when she was a U.S. Army Signal Corps military instructor at Fort Monmouth in New Jersey. There she became the first woman to teach the Army's computer maintenance course. After the Army, she held a number of jobs in the electronics field, including a stint at Searle Diagnostics in Illinois. At Searle she trained people to use the Intel 8080 microprocessor and was directly responsible for the maintenance of new products such as nuclear cardiology equipment. Along the way, as her biography notes, "she became fluent in assembly language and hardware architecture for 22 different microprocessors." She came to Southern California 3 years ago as a microprocessor development specialist for Tektronix and a year later founded her own company, MicroPlus, a combined program writing, hardware design, and engineer training service.

SECT is an outgrowth of MicroPlus. It has nine full-time and ten part-time employees, all chosen on the basis of being "people who are totally committed to raising consciousness," according to Burns. Chief among their services are workshops offered to the general public in basic computer literacy, plus short courses in word processing, electronic spreadsheets, data base management, and various computer languages.

Hands-on classes at the SECT center in Encino are conducted on a fleet of Apples. "It's what a lot of people want; they think Apples are less intimidating," according to Burns. She says they'll be switching over to IBM PCs in the future, however, because she believes that they're the machines most business people will prefer. (She herself travels with an Osborne.)

In addition to the classes and the firm's regular road show with the Small Computer College, SECT does extensive on-

site training for companies undergoing computerization, schools and organizations, and even tech-talking computer dealers and manufacturers who want to learn the best method of teaching the public to buy and use computers. SECT's past clients include ABC and NBC, General Dynamics, the Carnation Company, the University of Arizona, the University of San Diego, Sears Roebuck, Osborne Computers, Mattel, 7-Up, and the U.S. Navy.

Today's Techies

SECT's former students tend to talk about their experiences in terms usually reserved for encounter group sessions: "I walked into that first seminar doubting my sanity, and I walked out knowing that I was normal," confessed Susan Gains, an operations analyst for a major Los Angeles food company. "With Burns, there's no such thing as a dumb question."

A nontechnical person with a business background, Gains had been put in a position in which she needed to know something about hardware purchases and program writing. She tried to teach herself, but she fell into the "computer abyss" before she had heard about SECT and persuaded her company to send her to an introductory workshop. She has since taken courses in BASIC and assembly language, moves that put her on an entirely different

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career track. Her firm has hired SECT for in-house workshops on the IBM PC and VisiCalc. (Gains is also planning to buy her own PC to use at home.)

Another student, DeWayne Cox, first heard Burns at an Anaheim computer show and was instantly riveted. "If I were to tell you the story of my life," he says, "one of the major themes is a right brain/left brain dichotomy." A former rock musician and actor (left brain), Cox is also a mathematics type who works as senior ac-

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counting coordinator for a Los Angeles ad agency. "Computers bring creativity and logic together, and Burns understands that and communicates that," according to Cox. "Most people are spooked by computers; a lot of the people who get into them are just thinking that it's where the money's going to be—it's like somebody 30 years ago deciding to become a plumber. I don't have either of those mind sets. I was ready for this."

Cox has convinced his company that he is the person who should be looking into

the computer market (mainly at systems owned by friends), "The more I got into it, the more I was overwhelmed." He had heard about SECT through word of mouth and hired Burns as a consultant.

"She nursed me through the decision to buy the PC," he recalls. (His system includes 256K, a 14-megabyte Davong hard disk in one of the IBM drives, a Diablo printer, the Baby Blue board, dBaseII, SuperCalc, WordStar, MailMerge, and the Peachtree accounting software package.)

SECT continues to work with his firm in developing a sales-tracking data base program, but what Papageorge is most grateful for is that Burns "put me on the learning curve."

"At various times along the way," admits Papageorge, "I would get really panicky. I would think I was buying the wrong system, or I would wonder whether I should buy a system at all. Somehow it's like stepping out into a whole new dimension of living—it's entering a new age."

Since the inevitable emotional sorting out, however, Papageorge has become a true believer. He is especially taken with SuperCalc, which, he says, "gave me a picture of the company I just didn't have. It's tremendously expanded my ability to think."

Burns believes that nearly every home will be computerized within 4 years—a statistic many would argue with, but one that she sees going hand in hand with changes in the way people view work itself. "We'll have to get out of the mentality that unemployment is a moral issue. I see a lot of programs that help people deal with having more leisure time." In most cases, she predicts, the computer of the future will be much easier to use than anything available, and the machine will be seen as just another household appliance.

"But even if only 10 percent of the population uses microcomputers, such use will, creatively speaking, be exponential. There will be creativity like we've never seen it." And she is one person who wants to be there. /PC

Lindsay van Gelder is a free-lance writer whose work has appeared in Ms., Rolling Stone, New York, and Vogue. She was formerly a news reporter for several New York daily papers. For more information on SECT, write P.O. Box 29780, Los Angeles, CA 90029, (213) 240-1574.



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NEARLY EVERY home will be computerized within the next 4 years.

what sort of office system to buy. He says that whether or not this particular project pans out, his career choices have now changed, thanks to his exposure to SECT. In fact, he sounds extremely at one with micros: "It's like my left brain is my operating system and my right brain is my microchip."

Both Gains and Cox report that career guidance, while not an advertised portion of the SECT training package, is a terrific throw-in. "The staff people are knowledgeable, and the classes are small," says Gains, "and they all balance each other out. Burns is kind of the dynamo who fires you up. Then the rest of them come in with all this patience."

The Business with Business

Yet another former client is Andrew Papageorge, president of Personal Resource Systems, Inc. in Delmar, California. The firm markets a ten-section notebook in which a person can file schedules, addresses and phone numbers, and short- and long-term goals. "So I'm obviously organization- and time-conscious," says Papageorge. "Still, before I thought about buying a computer, I had never even read a newspaper article about one."

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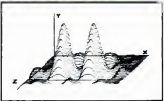
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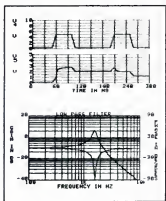


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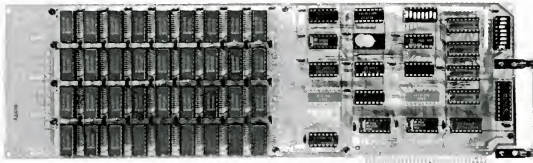
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Speak To Me, PC!

An easy-to-use and reasonably priced device that turns your text into spoken words.

Echo GP Speech Synthesizer
Street Electronics
1140 Mark Ave.
Carpinteria, CA 93013
(805) 684-4593
List Price: \$299.95

The phrase "Come out and fight like a robot!" is part of a popular video arcade game that uses a simple voice synthesis device to enhance the game-playing experience. Voice synthesis can add appeal and efficiency to many microcomputer applications, especially in aid to the handicapped, aural proofreading, and user training.

It's no surprise that people are uncomfortable using many computer systems. People who are accustomed to multilevel visual and aural communications are asked to limit themselves to reading words presented in strange forms (video screens and dot matrix print) and to type out their thoughts on a keyboard.

Voice
*recognition devices
are still limited in
accuracy and require
large amounts of
memory.*

The more color and graphics a program includes, the better it communicates with the user. Vision is usually the most powerful human mode of perception, taking up most of the brain's sensory processing area. Although sight can quickly convey general impressions, many details and intellectual concepts are best expressed by speech. Voice synthesis (getting a computer to "speak") and, to a lesser extent,

voice recognition (making the computer "understand" human speech) devices are allowing speech to become an important part of the computing process.

Voice recognition can be an extremely helpful method of data entry or of issuing commands to the computer, especially for the visually handicapped. Voice recognition devices, however, are still limited in accuracy and require large amounts of memory. The development of microprocessors that are able to address large memory blocks and continual improvements in memory density and cost will allow the introduction of practical voice recognition devices within 2 to 3 years.

Practical voice synthesizers are available at reasonable prices. Three technically mature methods of voice synthesis are now on the market: format synthesis, waveform digitization, and linear predictive coding. Each of the techniques has individual strengths and weaknesses for various applications.

Format Synthesis

Format synthesis, or synthesis by rule, was developed by Votrax. (See the review of Type-N-Talk in this issue.) This system breaks speech into phonemes, the smallest distinguishable units of sound. The system also provides for different pronunciations of phonemes in different contexts, or allophones. The phoneme p in piono, for example, is an allophone of the p in spin.

The most developed Votrax units provide 128 allophones that are strung together to form an unlimited vocabulary. The speech provided by this system is excellent, but selection of allophones requires a large amount of programming time.

Waveform Digitization

A word spoken into a microphone can be broken up and digitized, and the resulting pattern of ones and zeros is saved on a programmable read only memory. This memory is read by a microprocessor when needed and replayed as sound. The phone

company often uses digitized speech to describe why a call has not been completed.

Waveform digitization can produce excellent speech in any language for which it is used, but it requires a great deal of memory to gain flexibility in what it can say. With data compression, one word can be stored in about 1000 bytes. Therefore, a 20,000-word vocabulary would require 2

WAVEFORM
*digitization can
produce excellent
speech.*

megabytes of fast memory, a prohibitive expense even with the rapidly decreasing price of memory.

Linear Predictive Coding

Easy-to-use voice synthesis with a large vocabulary can be achieved at a moderate price and only a slight sacrifice in speech quality. Linear predictive coding, developed primarily by Texas Instruments, uses integrated circuits to represent the human voice tract. A synthesizer and linear filter mimic the operation of vocal mechanisms. A microprocessor calculates and predicts the acoustic patterns and calls a read only memory to provide speech parts. The speech parts are coded according to their voicing, pitch amplitude, and frequency. Since the human voice is not a very fast communications port, this system can provide an acceptable rate of speech by operating internally at 1,200 bits per second.

Many have heard the results of this process as the output of the Speak and Spell devices from Texas Instruments. The voices are not as clear as a tape-recorded voice's, but they become easy to understand after a few minutes.

The Echo GP Speech Synthesizer

Street Electronics has incorporated an upgraded version of the Texas Instruments TMS 5200 speech processor into the Echo GP, a simple text-to-speech unit that interfaces with the IBM PC.

This system uses linear predictive coding to pronounce a stream of standard English words from text fed to it through the PC's parallel port (for the Echo GPP) or RS-232C serial port (for the Echo GPS). No

special software is required other than the word processing or communications program used to feed the words out to the port.

Software written in BASIC can easily be modified to send word strings to the speech synthesizer and repeat or add detail to the information presented on the display screen. The serial version (Echo GPS) can echo characters to the screen or can be "daisy chained" to another serial device such as a modem. The Echo GP has

an internal memory buffer of 250 characters. It will begin speaking when its buffer is full or when it receives a carriage return.

The Echo GP is small and sturdy; it combines real wood and high technology in an attractive unit. The power supply is a plug-mounted transformer, and the unit has its own speaker and audio amplifier.

The Echo GP contains special circuitry to convert the word stream into components that the Texas Instruments processing system can understand. As an alternative, special codes can be transmitted to put together phoneme strings. This second method enables the Echo GP to perform with languages that are not derived from the same roots as English. Languages sharing Latin or Greek roots can be entered with common spellings or slight phonetic modifications. The Echo GP does a good job on French, Spanish, and Japanese.

Help Is In Sight

A terminal for the visually impaired enlarges and enhances video text display.

Large Print Video Terminal
Arts Computer Products, Inc.
80 Boylston St. #1260
Boston, MA 02116
(617) 482-8248

List Price: \$6,900; keyboard (optional)
\$249; black and white monitor (optional)
\$349

The Large Print Video Terminal (LPVT) is a stand-alone device that buffers, enlarges, and enhances standard video output to allow the sight-impaired to interact easily and efficiently with any computer system. It can be used wherever an ASCII terminal is in use. It connects to the PC through an RS-232 serial communications port.

The LPVT consists of a standard 19-inch color or black and white monitor, a typewriterlike keyboard, and a Z-80 microprocessor with a power supply and ten-slot S100 enclosure. The terminal could be used primarily as a display device for the PC. The PC's keyboard can maintain full compatibility with programs that utilize the function keys.

Unlike other units used for similar purposes, the LPVT is self-contained and requires no special external software to adapt it for use with the IBM PC or any other computer system.

Flexibility is the LPVT's greatest asset. The terminal can be used by people who have varying degrees of visual acuity. It is an easy matter to adjust the terminal for someone with 20/20 vision and then for a user with 20/400 vision.

The flexibility is incorporated in the terminal's built-in software. In the "for-

mat" mode, for example, the user can control the size and spacing of characters, and the speed with which text appears on the screen. The "host" mode controls communication between the terminal and the computer system so that format changes may be made independently of the computer.

The manufacturer also produces a speech synthesis device, called the Orator, and a terminal that combines features of the LPVT and Orator in one unit.

The terminal does have a few shortcomings: It has only one RS-232 jack that connects it to the computer. Therefore, a printer or modem must be connected to the computer, and not directly to the terminal. The numeric keypad that operates independently of the standard keyboard is not adequately labeled. The cursor position is also a problem when extreme magnification is used on the terminal. Knowing the exact column location of the cursor becomes difficult. Cursor position is especially important when programming in FORTRAN or COBOL because commands and expressions must be in specific columns. The programmer is forced to count out spaces to keep things in the proper columns.

These shortcomings notwithstanding, the LPVT is an excellent vehicle that provides computer systems access to sight-impaired individuals.

—Michael Martin

Michael Martin is legally blind. He is in his junior year of San Diego State University and is majoring in Information Systems.

A *POTENTIALLY
valuable use of the
Echo GP is the
generation of
compressed speech.*

Various features of the system can be activated by control codes placed in the character stream. A Ctrl E gets the system's attention. Other control codes vary the pitch of the voice (it always sounds male), allow the unit to try some vocal variety (with mixed results), adjust the volume from the console, control punctuation, and handle upper- and lowercase.

A potentially valuable use of the Echo GP is the generation of compressed speech. Compressed speech reduces the amount of time required to transmit information by nearly half, but it takes some practice to understand. Compressed speech would be particularly useful for visually handicapped persons who would have a great deal of experience with the system and want to move a lot of information through it.

Phonetic Spelling

The Echo GP is preprogrammed with nearly 400 rules, allowing it to correctly

pronounce over 96 percent of the 1,000 most commonly used words in English. However, the system will mispronounce many English words unless they are spelled phonetically. Phonetic spelling can be mastered with a little practice. The user quickly learns to recognize the correct phonetic spelling when the Echo GP mistakenly makes a standard English text sound like French. Without phonetic spelling, the quality of the speech produced by Echo GP requires the inexperienced listener to pay close attention. If phonetic spelling is used, even a casual listener can understand every word after 2 or 3 minutes of listening.

Using the Echo GP

This device can be used in a variety of ways without any modification to the PC or other existing hardware. A writer can use the Echo GP to read an article back before the final printing. Even after the use of a spelling checker, a writer may still have duplicated words or awkward sentence constructions in the text. Listening to

the text may uncover errors that would go by unnoticed in a second silent reading.

Echo GP could also be an excellent

COMPUTERS
are beginning to talk
to us. Soon they'll be
listening as well.

way for the visually handicapped to use an information utility such as The Source or CompuServe. The UPI service on The Source provides a keyword search of current news items. Visually handicapped persons could have Echo GP connected with a modem through the PC's serial port, hear the prompts spoken, and then capture interesting news and information on disk by using a terminal program such as Crosstalk. After signing off the utility, the

stored disk files could be sent out the serial port to the Echo GP.

In education and business, voice systems are particularly good for explaining procedures and commands to new users. They can be used just as the voice is in human communications—to explain the details of processes shown in graphic form on the screen. The audible text need not be the same as the visual text and may enhance the visual presentation.

In games, vocal text can explain rules that are boring or confusing to read, as well as support, motivate, or otherwise interact with the game player.

Watch and Listen

As computer technology matures, devices that promise to change the nature of communications are becoming more readily available. The Echo GP Speech Synthesizer demonstrates the reality of that promise. As display screens are filled with color and new shapes, computers are beginning to talk to us. Soon they'll be listening as well. /PC

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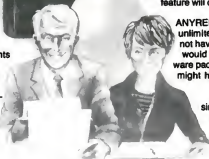
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How To Copyright Your Software

Attorney Daniel Remer offers legal counsel to protect your programs from piracy—Part Three.

This is the last of a three-part series on copyrighting computer software. Part One defined copyright and explained how to give correct copyright notice. Part Two brought the reader through the mechanics of filing with the Copyright Office, and this month's conclusion discusses the legal remedies available to copyright owners, as well as the problems owners face in enforcing their rights under the copyright law.

Warning

This software and manual are both protected by U.S. Copyright Law (Title 17 United States Code). Unauthorized reproduction and/or sale may result in imprisonment of up to 1 year and fines of up to \$10,000. Copyright infringers may also be subject to civil liability.

This notice informs all purchasers and users of computer software and manuals that specific items are protected under the copyright laws of the United States. The notice seems simple enough; it warns against the "unauthorized reproduction and/or sale" of computer software products. Yet as a complex industry becomes even more complex, so do the laws that govern it. Many contend that the current copyright law does not adequately protect computer software and technology. In both the computer and legal press the copyright law is often bemoaned. But, although the code may need some improvement, it isn't as toothless as some believe.

There are several good reasons for the copyright law getting such bad press. The first is that most lawyers and computer writers are fairly ignorant of the law. It does not protect, nor was it ever designed to protect, the actual ideas embodied in software; this fact is often misunderstood. It is legal to steal a program idea as long as

the idea's form of expression is not copied. (This point was discussed in Part One of this series.)

A problem frequently cited by critics of copyright law is that infringers are hard to catch and cases are often difficult to prove. There is much confusion as to how much protection can be given to object code (the actual messages that direct the workings of a computer) and especially object codes contained in ROM.

Nor much can be said about the ignorance of copyright commentators; time will doubtless take care of much of this problem. That software piracy is difficult to prove is no reason to denigrate the copyright law. Arsonists are difficult to catch, and, when caught, their crime is often difficult to prove. But this does not lead most people to the conclusion that laws against arson are worthless. When pirates who are profiting from stolen programs are caught, current laws will probably help remedy the situation.

The U.S. Code

U.S. Copyright Law is formally referred to as Title 17 of the United States Code, Copyrights. References to specific statutes within the section dealing with copyrights are usually written as follows: (17 USC 502) or (17 USC 504). The numbers 502 and 504 refer to the specific citations within the code.

Remedies: Civil and Criminal

Current law provides for both civil and criminal penalties against copyright infringers. These penalties may carry fines and/or imprisonment, depending on the infringement. Criminal lawsuits are initiated by the government and require the cooperation of a federal prosecutor. If a

company were accused of unlawfully selling copyrighted material to another company or to a foreign country, criminal prosecution might well ensue. In addition, the owners of the copyrighted material could bring a civil suit against the infringers.

The penalties referred to in the warning that began this article—\$10,000 per infringement and 1 year in jail—apply in cases of criminal prosecution.

In civil cases, the Copyright Code allows for the recovery of profits that pirates have made from copying and/or selling stolen software. If the losses cannot be proven, or if the losses weren't primarily monetary (a company might, for instance, suffer a loss in reputation) the courts may award from \$100 to \$50,000 per infringement. These awards are referred to as "statutory damages"—money damages defined by a statute within the code.

The law further provides that the courts may require the defendant to pay court costs and attorney's fees (17 USC 505). When willful infringement has been proven, such an award is likely.

In addition to money damages, injunctions are often granted that prohibit pirates from continuing to copy or sell stolen material (17 USC 502). Other statutes (17 USC 602, 603) stop the importation of infringing software through U.S. customs. With the severe criminal and civil penalties the courts are meting out, copyright infringers will do well to reconsider any plans they may have.

Daniel Remer is a partner in the law firm Remer, Remer and Dunaway of Mountain View, California. He is also the author of *Legal Care for Software* [Addison-Wesley, Reading, Massachusetts, 1982]. More of Mr. Remer's legal counsel will appear in PC, February, 1983.

The Piranha Problem

One of the reasons pirates are so difficult to catch is that most don't copy programs on an ongoing professional basis. I refer to these not-for-profit infringers as piranhas; individually they don't do much damage, but together their nibbling may represent a significant threat.

Making copies of copyrighted software by anyone except the owner of the copyright is a violation of the law. But piranhas are difficult to locate, and the copyright law itself cannot keep them from occasionally taking a bite. No law can. Eventually some angry software author will drag one of these piranhas into court, but most owners have neither the time nor the money for such gestures.

Difficult as it may seem, software authors should stop fretting about not-for-profit piracy. Such small-scale operations will probably always be in existence. It is against larger profit-making operations that specific court cases are deciding the meaning of copyright law.

MicroPro vs. Data Equipment

One recent court case has begun the process of interpreting copyright law as it applies to computer software. MicroPro International and Digital Research, the publishers of WordStar and CP/M respectively, used the copyright law successfully to stop a pirate from copying object code.

The law clearly provides that software is eligible for copyright protection (17 USC 101[a], 117). It defines a computer program as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result" (17 USC 101[a]). This definition seems broad enough to cover just about all forms of software. Some people argue, however, that certain pieces of object code, specifically ROMs, cannot be copyrighted.

In the case in question, Data Equipment Inc. was a dealer for MicroPro and Digital Research. Former employees of Data Equipment reported that they had been asked to create unauthorized copies of WordStar and four other programs.

Ron Laurie, an attorney with the law firm of Townsend & Townsend, which specializes in intellectual property matters, represented MicroPro and Digital Research. The lawsuit was purely one of copyright infringement. This in itself was significant since Data Equipment, as a Mi-

croPro dealer, could have been sued for breach of contract. Apparently MicroPro felt that the best recourse lay within the copyright law.

The case resulted in a consent judgment in which both parties agreed to abide by a settlement made by the judge. The case has no value as a legal precedent, but the results are encouraging. Rather than try to prove each and every instance of copying, the plaintiffs opted for statutory damages. The award was assessed at the maximum of \$50,000 for each pirated program—a total of \$250,000. Attorneys' fees were assessed at \$30,000. Overall, it was an impressive settlement for a law some call toothless.

Whether the plaintiffs will be able to collect the monies awarded them is doubtful. If the defendant doesn't have sufficient assets, there won't be much money for MicroPro and Digital Research. Nevertheless, MicroPro vs. Data Equipment (August 20, 1982) remains possibly the first case on record that involves copyright protection for microcomputer application software in object form.

Apple vs. Franklin

Another recent case illustrates the complexities involved in copyright infringement cases. In *Apple Computer Inc. vs. Franklin Computer Corp.* (U.S. District Court, Eastern District of Pennsylvania,

Catching a Copyright Pirate

Proving infringement isn't always easy.

Catching a copyright pirate can be difficult if not impossible. There is little problem in a case like *Apple Computer vs. Franklin Computer*. Franklin made no attempt to hide the fact that it came with "Apple-compatible software." Apple now faces the task of proving that its software was eligible for copyright protection in the first place. If this is determined in Apple's favor, proving that the program was copied should be fairly easy.

The toughest cases to prove involve pirates, often former employees, who copy relatively small portions of code, or who copy whole programs and then disguise them. These cases have been broken when suspiciously similar bugs have appeared in both programs. One case was proven because of typos in comment statements that reappeared in the pirated version of the program.

Sometimes it is too difficult to prove program copying. Instead, if a manual or documentation is copied in addition to the program, the pirate can be stopped on the grounds that the copyright in the documentation was infringed. Circumstantial evidence such as the sudden departure of an employee to set up a competing company has helped prove infringement cases.

Even if evidence of copying can be proven with some satisfaction, it may be difficult to convince a jury that one program is copied from another if the programs look the least bit different. —D.R.

"Any exact copies prepared in accordance with the provisions of this section may be leased, sold, or otherwise transferred, along with the copy from which such copies were prepared, only as part of the lease, sale, or other transfer of all rights in the program. Adaptations so prepared may be transferred only with the authorization of the copyright owner." (§§117. Limitations on exclusive rights: Computer programs.)

Copies of programs can be made under certain conditions. The first condition refers to configuring a program to run with a certain computer and creating a copy by doing so. The second condition allows a backup copy to be made for archival purposes. Although the law allows backup copies of a program to be made, if the possession of the program "cease(s) to be rightful," all backup copies must be destroyed. Possession ceases to be rightful when the program or a copy is sold or given away.

What bearing do the legal-sounding warnings on copy-protected software have on the right of legal owners to make backup copies? This hasn't been tested in the courts, but for mass-marketed software where no face-to-face relationship exists between software publisher and purchaser, such warnings are probably meaningless. The law specifically allows individuals who bought programs to create backup copies.

—D.R.

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Programs Copy Programs

Making backup copies of copy-protected programs, or, people don't copy programs; programs copy programs.

For the last few years powerful copy programs have been available for all personal computers. These programs can copy even the most sophisticated copy-protected programs. When a software publisher thinks of a better copy protection trick, it is only a matter of days or even hours before it is cracked. The question frequently arises, is it legal to copy these programs for one's own use?

Copying a program is illegal if the program was not legally obtained. It doesn't even matter whether the program is copy protected; if the program wasn't purchased legitimately, it cannot be copied legally. But what if someone purchases a legitimate copy of VisiCalc and wants to make a backup? Following is what the law

says.

"Notwithstanding the provisions of section 106, it is not an infringement for the owner of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program provided:

"[1] that such new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner; or

"[2] that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

[July 30, 1980], Apple asked the court for a preliminary injunction ordering Franklin to stop selling certain software on the grounds that it infringed on Apple's copyrights. Some of this software was contained in ROM chips on the Franklin computer.

If the court had granted Apple its injunction, Franklin would have been barred from selling its Ace computer. As a practical matter Apple was saying, "Order Franklin to stop selling its computers until we can hold a full trial on whether or not Franklin has been infringing on our copyrights."

In a lengthy opinion the court refused Apple's request for several reasons. The judge had some doubt about whether Apple's copyrights on its programs were valid. In order to be granted a preliminary injunction, Apple needed to show, among other things, "a reasonable probability of success on the merit" of the case. In other words, Apple needed to convince the judge that it would ultimately win its full trial. Apparently the judge was not convinced (though more recent cases indicate that the judge's ruling was incorrect).

The second reason that Apple did not receive the injunction had to do with balancing equities. The court decided that forcing Franklin to stop selling computers pending the full trial would damage the

company unfairly. According to the court, Apple was playing the part of the big company trying to squash the small company. Judge Newcomer observed: "Apple is better suited to withstand whatever injury it might sustain during litigation than is Franklin to withstand the effects of a preliminary injunction. While I am not prepared to find that the injunction sought by Apple would force Franklin out of business, it would certainly have a devastating effect."

While Apple has suffered a setback in its suit against Franklin, this is only round one. Should Apple win its case, Franklin will probably be liable for damages incurred throughout the period that it continued to sell its computers. If it can be shown that Franklin copies Apple's programs, Apple stands a good chance of winning. That some of these programs were in object code, stored on ROMs, should have no bearing on whether they can be protected under copyright law.

Other Legal Questions

Similar court cases decided both before and after Apple vs. Franklin support the eligibility for copyright protection of object code resident in ROM. One such case, Tandy Corp. vs. Personal Micro Computers, Inc. [524 F. Supp. 171 (1981)] involved the theft of Tandy's I/O routines

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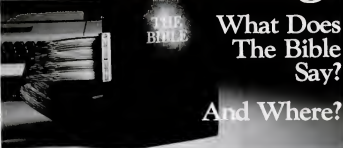
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for use in a competing computer. The defendant made an interesting metaphysical claim: A ROM chip that is a copy of another ROM chip is not a copy of the original copyrighted program. The court disagreed, holding that a copy of a ROM is an infringing copy. Similar decisions have been made with respect to video games.

THE COPYRIGHT law will have a great bearing on the future of microcomputer technology.

While the question of copyrighting an object program in ROM is being settled, other questions arise. Is it an infringement if someone copies a FORTRAN program, but the copy is written in BASIC? In literature, an original work cannot be translated from one language to another without permission from the copyright holder, but computer programs are arguably different. To translate a program, one might essentially have to rewrite it. Is this copying?

Another puzzling question concerns people who buy a program that was designed for a single user on a single computer and use the program on several computers (or terminals) simultaneously. A business, for example, might buy only one copy of VisiCalc to share among its ten PCs. Is this legal? Is it fair?

In Summation

The copyright law—Title 17 of the United States Code, Copyrights—will have a great bearing on the future of microcomputer technology. The meaning of "unauthorized reproduction and/or sale" will continue to fluctuate between the pure intent of the law and what is possible under the law. As the industry continues to grow, new applications will give rise to new questions. And after the questions, new answers will surely follow. /PC

Readers with comments on the issues raised in this series, or on other legal issues, are welcome to send them to Doniel Remer, PC, 1528 Irving St., San Francisco, CA 94122.

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Modus Operandi: How To Write A Computer Game

A computer game designer reveals the pitfalls in producing a commercial game and offers tips on how to avoid them.

People create computer games for a variety of reasons. In my case, I wanted to give my kids something to do with the computer besides seeing who could hit the keyboard the hardest. Developing Omegabug was hard work, but it did stop my kids from pounding the keyboard. Now they keep asking me when I'm going to get off the PC so they can play the game.

Put It Down on Paper

As with any project, the best way to begin is to decide exactly what's wanted and why. Write down goals and strategies. The ultimate purpose and system limitations of a program will narrow the options. This can facilitate system design.

My original goal was to create a game that I could enjoy as much as my children. The game would require a means of varying speed and complexity. At the same time I wanted a game that exercised and improved players' hand-eye coordination and that any new system purchaser could play without having to buy additional hardware and software. I had to consider alternatives before I began programming, but my criteria pointed me in the direction of a "shoot and attack" concept.

The IBM PC minimum system configuration offers two options for display monitors: monochrome or color. Because I wanted the game to be compatible with both options, I had to design it accordingly. I had to consider whether to use a joystick or keyboard for input. People don't normally buy the IBM PC solely for entertainment, so I decided to control the game from the keyboard, saving users the trouble and expense of purchasing and calibrating a joystick.



One of the many challenges is to develop a game that doesn't resemble anything else on the market. Nothing is more disconcerting than the threat of a lawsuit, especially if a large company's lawyer comes calling. Careful research and planning at the outset helps avoid such headaches.

The initial planning stage is a good time to note personal likes and dislikes. Nobody enjoys plunking a quarter into an arcade game, playing for 3 minutes, and getting wiped out. "#\$%&!@" is my usual response. I dislike being wiped out by randomly generated characters. In Omegabug, players dig their own graves; their mistakes lead to their ultimate demise.

Character Set

The initial requirements called for a game in which the object is to destroy an attacking enemy. This meant selecting suitable characters for the player, the weapon, the enemy, and other game features from the character set available on the IBM PC. It's important to select characters that don't resemble each other and to remember to keep the screen uncluttered. Don't worry about color at this stage of development; that comes later.

I decided to use double vertical diamonds for the weapon and the cursor arrow for the missile. The Greek character Omega serves as the omegabug, which moves from left to right, drops a column, and moves from right to left until it is either shot or collides with the player's weapon. Another omegabug, called a dropper, falls vertically, trying to land on the weapon. A U indicates a dead omegabug, and periods, dot patterns, and solid bars serve as barriers and obstacles.

Strategy

After devising a set of characters, you can begin operating the game. Everything starts moving fast at this stage, tempting the game designer to think, "This is great." But developing the skeleton is the easy part. Revisions are inevitable, so it's best to number them: Omegabug1, Omegabug2, and so forth. Keep backup files at all times; nothing is more frustrating than having to reconstruct a lost program.

My list of requirements called for a game that varied in speed and complexity so that it would appeal to a variety of players. Omegabug began with a feature that

allowed players to select speeds on a scale of one to four, with four as the fastest. After I began adding features and action, I began testing. The best test is to let kids play the game. While testing, remember that not everyone has the same visual acuity, and some reactions have to be discounted.

By revision number 24, I had refined the game enough for the player to maintain control over operation. A variety of people of different ages played the game, and I noted their reactions. I decided to introduce new elements and features while preserving the characteristics of previous stages to maintain continuity. For example, the omegabug appears in the first stage; a glider lays down a dot-pattern barrier in the second stage; and droppers begin to appear in the third stage. The game increases in complexity until the tenth and final stage, when the player wins if his or her weapon hasn't been hit. As players increase their proficiency, they can select a higher speed to keep the game challenging.

Scoring

The scoring strategy depends on the level of difficulty of various operations. For example, it's hard to hit an omegabug moving horizontally across the screen; for this the player earns 100 points. Yet the wild, random shooter can hit it with ease.

SOUND IS perhaps the most difficult feature to perfect.

The scoring solution is to penalize ten points for any missile that goes off the screen. Only two possibilities prevent missiles from going off the screen: hitting an omegabug and colliding with the various barriers that start to appear in Stage 3. Hitting easy targets, such as trails of dots, pen-

etrating barriers, or dead omegabugs, earns only one point.

Omegabug includes features to foil the "system player," the person who employs a consistent strategy to beat the game. While cluttering the screen with dead omegabugs may give the player an advantage during the early stages of the game, it becomes a disadvantage as the game progresses. Such features keep the player alert by forcing changes in strategy and adding interest to the game.

Sound and Title

Sound is perhaps the most difficult feature to perfect. It must suggest impending action to assist the beginner, yet avoid antagonizing the advanced player. At times (late at night, for example) players may wish to disengage all computer-generated sound. Omegabug includes a prompt at the start of the game that allows the player to select the no-sound option.

Developing a different sound for each character and action requires trial and error. After listening to more than 300 different notes over a 5-hour period, one can no longer discern which sounds or combinations of sounds are best. Understanding a few basics helps.

Each unique character or action should have a distinct sound. In Omegabug, players can distinguish between droppers, gliders, and barriers by their sounds alone. An experienced player should be able to recognize what's happening from the sound alone. For example, hitting an omegabug produces a distinct sound. Generally longer, lower-frequency sounds suggest slow action, and high-pitched, short sounds signal fast action. Sliding frequencies represent continual motion. Sound can both reward and chastise players. When they rack up points, for example, cheerful sound should acknowledge their accomplishment. Sounds should be as pleasing as possible. Care must be taken to avoid shifting from low to high frequencies too abruptly, as this tends to irritate players after awhile.

Before moving on to color, decide on the look of the title. This is probably the single most subjective element in the design of a computer game. It's a personality area; programmers can do just about whatever they choose. I've seen games in which the title presentation displays more graphics and fancy features than the program

Secrets of Sound

The PC possesses a symphony of audio abilities.

Through its monitor the IBM PC demonstrates a protean ability to change form. It can display an infinite variety of sound-color-shape combinations. Certain mortals, called programmers, study this capability and manipulate it by creating programs. Tapping into the programming power of the PC, however, does not require magical incantations, years of apprentice wizardry, or pilgrimages to Delphi. It takes inspiration, time, and know-how.

The Secret of Sound

The IBM PC generates sounds through a built-in 2¼-inch speaker. In assembly language, one can choose between two methods for engaging the speaker. The first is to toggle the Intel 8255A-5 Programmable Peripheral Interface chip (PPI) via bit 1 of I/O port 61H. The second method uses the gating of an Intel 8253-5 Programmable Interval Timer (PIT). The clock is a 1.19MHz signal and gate 2 is controlled by the PPI at bit 0 of I/O port 61H. Both approaches can be combined to allow great flexibility in sound generation.

In BASIC, two statements generate sound: Sound and Play. The Sound format is:

SOUND freq,duration

Freq stands for frequency of the sound (37Hz-32767Hz). Duration is the length of time the sound is on. It is measured in terms of clock ticks, which occur 18.2 times per second. The value of duration can range from 0 to 65535 clock ticks; consequently, total time on for a tone ranges from 0 seconds to over 1 hour.

The Play format is:

PLAY string

String is a series of music commands. The BASIC manual contains many combinations, variations, and intricate details of the Play statement. String can be composed

itself. This is not my particular preference. Omegabug displays a simple title that includes the copyright notice and company name.

Color

Color should be added only after action, title, and sound have been debugged. A good general rule is to use color to minimize the player's frustration. Color can be dynamic, but use it judiciously; poorly applied color can be a disaster. Consistency is the key to proper use of high-contrast and subdued colors. Critical features and anything that's urgent should stand out clearly. Features that aren't viewed often and don't change much should be consistently subdued.

The eye is easily fooled by contrasts, so be careful with the colors of adjacent characters. Use flashing only to gain immediate attention, and don't use it for too long. A black background works best. Try to avoid filling the outside display area.

The most difficult features to color are those that aren't critical but are nonetheless too important for subdued treatment. They shouldn't distract the player from urgent features, block critical characters, or clutter the screen.

One of the original requirements of Omegabug was minimum system configuration. I had to consider that users may connect their PCs to a poor-quality display. I added color to the program and tested it with old color televisions so it would perform even under poor circumstances.

RF (radio frequency) modulators and set-up colors don't necessarily correspond between displays, so at the start of the game I added a prompt that gives a choice of three different color combinations.

In its final form, I tested Omegabug on four RGB monitors, three different color television sets with two different RF modulators, one black and white television, and two monochrome monitors. These tests demonstrated that the control knobs on color television sets can improve colors on the game. The best color television display is obtained by turning off the brightness and automatic color controls while leaving on the AFC (automatic frequency control).

User-Friendliness

"User-friendly" normally means minimizing the quantity and complexity of display information to avoid overwhelming

Continues

of musical notes with symbols for sharps and flats. It's possible to set an octave of music or a single note independent of an octave. The length of notes and pauses can also be set. BASIC provides for adjustable tempo and normal, legato, and staccato commands. Music can be played in foreground or background and can be specified by substrings.

The following, short BASIC programs demonstrate some of the sound capabilities of the IBM PC.

Sound Demonstration Program

```
3810 KEY OFF WIDTH 40 : CLS : ' turnoff soft key display, set to 40 characters per column,
      and clear the screen
3820 PROGRAMS="SOUND GENERATION DEMO" 'title of program
3830 SCREEN 0.1 'set to text mode with color on
3840 LOCATE 10,10 : PRINT PROGRAMS: 'print title
3850 FREQ=150 'initialize it
3860 FOR R=1 TO 38 'do it 38 times
      and clear the screen
3870 SOUND FREQ,5 : LOCATE 20,R : PRINT ".": 'generate sound and place dot
3880 FREQ=FREQ*.1 'go up 10% each time
3890 NEXT 'do till done
3100 FOR R=38 TO 1 STEP -1 'do it 38 times
```

the user. With this as a guideline, I decided to use the prompt "Press any key to continue." My motive was pure and the prompt seemed innocent enough, but unexpected repercussions revealed that game designers must test even the best of intentions.

**AS PLAYERS
increase their
proficiency, they can
select a higher speed
to keep the game
challenging.**

Many players were confused by so many choices; they couldn't decide which key to hit. My solution was to change the prompt to "Press the space bar to continue." This solved the problem as far as adult players were concerned but didn't uncomplicate matters for kids. They thought the space bar was a cosmic saloon. Also, other programmers preferred the original "Press any key..." because they felt "Press the space bar..." was too restrictive. My solution was to retain the space bar prompt on the monitor and the "any key" function of

a Halt key that allows players to stop the the keyboard. This seemed to satisfy everyone. Most players soon realized that they could actually use any key despite what the prompt tells them.

Using batch files is another way to maintain user-friendliness. These call up files that might otherwise be difficult for the user to remember. For once-only procedures, such as transferring the PC-DOS onto the disk, a SETUP batch file is ideal.

Try to cover as many bases as possible in the batch files. For example, the PC automatically calls up AUTOEXEC file, which calls up the Omegabug file, which in turn calls up MDPOMEGA (monitor determination program execute file), that eventually calls up the actual game program. The game will then start at power up, at system reset, or if the user types in the name of the game.

There are other user-friendly considerations. Players who discover that they have chosen a game speed inappropriate to their skill levels should not be forced to choose between restarting the whole system or playing the game through to the end. Omegabug allows them to press a Restart key to begin again without rebooting.

Players should be able to get up from the game at any point without losing it. They may be in the midst of a super game when the telephone rings. Omegabug has

action and resume as often as necessary.

Players have enough to do without having to worry about scoring. The score indicator on the monitor should keep an easy-to-read, reliable, responsive account of the score at all times. In Omegabug the score box also indicates the current stage of the game.

Revisions

Omegabug went through 79 revisions, required about 5 months to complete, and probably generated a 6-inch stack of printouts. When a game program is finished, let some kids loose on it. If it's still up and running after an hour, it may really be complete. Always number each program revision sequentially. I recommend saving the five latest revisions and any "golden" copies, those that provide a record of major turning points in the design.

The importance of keeping backup files cannot be overstated. I have two completely independent disks on which I make backups at all times. Even the best of backups can cause problems. For example, at 2 a.m. one morning I finished programming a particularly difficult part of the code. I optimized it for speed, saved it, put my backup disk in, saved it, and went to bed. I tried running it in the morning and discovered that I had saved nothing but garbage. I kept my fingers crossed as I loaded my backup copy, but it was just as bad. Needless to say, I was quite frustrated. It took another 4 to 5 hours to reconstruct what I had done the night before because I had been too sleepy to print out the improvements.

User Manual

Always write a user manual. Some game designers put a manual on the disk and let the user print out a hard copy. Don't do it that way.

Keep the manual short and to the point. Use examples—graphic ones if necessary. Avoid dot matrix printing. Break the manual up into small, discrete topics that can be read independently. Try to limit these to one page each (or two facing pages). Remember that most users read manuals when all else fails. If they read one full page, the manual may be considered a success. Always include a company address and telephone number to give users the option of contacting an expert. Players often make useful criticisms and offer excellent suggestions; they should be consid-

ered a resource.

Even if most players never look past the first page, manuals should be user-friendly. Those who are interested should be able to read further and learn a little more about the game: how it originated, explanations of the characters, how they move up and down the screen, how firing in a particular sequence can raise the score. Those who take the time to read the manual should be rewarded for their extra effort with tips on defense and clues on progressing through stages of the game.

All told, I probably wrote ten or 12 versions of the Omegabug manual. Probably the next best test of any game after handing it over to the kids is to try it on people who have never played it before and who know nothing about computers. Give them the disk and the manual, and see if they can start it up on their own. Such a test can be very instructive.

The Real World

There are many points to remember. The most important: Ideas are generally free. Put down in writing the purpose of a proposed program. Define strategies. Write the initial version with limited I/O

and for black and white. Test, test, test. Perfect the program before adding color or sound. Always keep golden copies, if for no other reason than to go back and see how the game developed. Test some more. Let kids play the game. Write a user manual for someone who doesn't even know how to locate the power switch.

Anybody interested in writing a game should pursue it, but be forewarned that it's not simply a matter of having an idea and getting it to work. It is a laborious process that at times is not much fun. Many details must be cleaned up and users' reactions taken into account. Once the game and manual are completed, the easy part is over. The really hard part—marketing—is about to begin. /PC

Alon E. Heimlich has been working with microprocessors since Intel introduced the 4004 in the early 1970s. He is presently general manager of Personal Computer Products, o Sinto Cloro, California, manufacturer of IBM PC software and plug-in peripherals. For a review of Omegabug, see "Superplayers Run the Guntlet" in this issue.

Continues

```
3110 SOUND FREQ.5 : LOCATE 20,R : PRINT " " : 'generate sound and remove dot
3120 FREQ=FREQ/1.1 'go down each time
3130 NEXT 'do till done
3140 ENO
```

Play Music Demo

```
4010 KEY OFF : WIDTH 40 : CLS 'turn off soft key display, set to 40 characters per column,
and clear the screen
4020 PROGRAMS="PLAY MUSIC DEMO" 'title of program
4030 SCREEN 0,1 'set to text mode with color on
4040 LOCATE 10,20,0 : PRINT PROGRAMS, 'print title
4050 STARTNOTE=15 'starting note value
4060 NOTE=STARTNOTE 'initialize it
4070 PLAY "L52" 'note length
4080 FOR R=1 TO 38 'do it 38 times
4090 PLAY NOTES : LOCATE 20,R : PRINT " " : 'generate sound and place dot
4100 NOTE=NOTE+1 : NOTES="N"+STR$(NOTE) 'go up 1 note each time
4110 NEXT 'do till done
4120 FOR R=38 TO 1 STEP -1 'do it 38 times
4130 PLAY NOTES : LOCATE 20,R : PRINT " " : 'generate music and remove dot
4140 NOTE=NOTE-1 : NOTES="N"+STR$(NOTE) 'go down 1 note each time
4150 NEXT 'do till done
4160 ENO
```

—A.H.

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With a little coaching and some BASIC ingredients, you and your PC can pick up where Archimedes, Gregory, and Euler left off.

Baking Pi In Your PC

Everyone has heard the classroom story about how pi (π) calculated many times over would fill all the chalkboards with small print. In 1961 an IBM 7090 computer was used to compute pi to 100,000 decimal places. In the last 20 years that landmark of "piology" has been exceeded many times. With the enormous advances in computer hardware, pi has been computed to over 1 million decimal places. For the fun of it, you can calculate pi to a large number of decimal places with an IBM PC—even without knowing advanced mathematics.

BASIC Ingredients

The decimal expansion of a number like $\frac{1}{3}$ can be represented as a decimal point followed by an infinite number of threes (.333...). Like all rational numbers, $\frac{1}{3}$ exhibits a pattern in its decimal expansion. After computing the first series of digits, you can predict what the rest will be.

Irrational numbers such as pi, however, never follow predictable patterns. It's not possible to know the first 100 decimal places of an irrational number until all 100 have been computed. Pi starts as 3.14159 and never displays a predictable pattern in its decimal expansion.

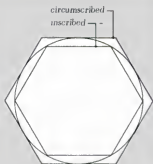
Historical Pi

The first person to find a reliable way of computing pi was the Greek mathematician and inventor Archimedes in about 240 B.C. Archimedes used the perimeters of inscribed and circumscribed polygons to approximate the circumference of a circle (see Figure 1). By increasing the number of sides of the polygons, he could squeeze the value of pi between the two bounds. Archimedes' calculations computed pi to between 3.140845 and

3.1428571—within two decimal places of accuracy.

Archimedes' method is programmable. A discussion of his method, a program, and the program results can be found in *Fifty BASIC Exercises* by J.P. Lamoitier (Sybex, Berkeley, 1981). It's difficult, however, to obtain more than about five decimal places of accuracy with Lamoitier's

Figure 1: Polygon Measurements



Inscribed polygons are those measured inside the circle (points touching). Circumscribed polygons are those measured outside the circle (flats touching). Archimedes used both polygon measurements more than 2,200 years ago to calculate pi to within two decimal places of accuracy.

method—results a calculator could obtain. The limitations of this method stem from the fact that as the number of sides of the polygons is increased, each side gets shorter, making it increasingly difficult to maintain accuracy in the length of a side.

Fortunately, more tractable methods of approximation were developed in the seventeenth and eighteenth centuries. The Scottish mathematician James Gregory

discovered an infinite series for the arc tangent. Recall that in a right triangle the tangent of the angle A is the ratio $x = a/b$, which we write as $\tan A = x = a/b$. Usually, we know the angle A and find the ratio x. However, if we start off knowing the ratio x and find the angle A, we find the arc tangent. So the arc tangent is just an angle, and the formula is written as $\arctan x = A$ (see Figure 2).

Gregory's timely discovery was the formula

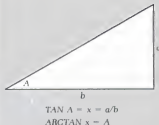
$$\arctan x = \frac{x}{1} - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots$$

All we need now to bake our pi is an ingredient provided by the Swiss mathematician Leonhard Euler. Euler's formula for pi is

$$\pi = 4 [\arctan (\frac{1}{5}) + \arctan (\frac{1}{239})]$$

Pi can be expressed in terms of two arc tangents that, in turn, are computed using Gregory's formula. Combining Gregory's and Euler's formulas yields an effective method for computing pi to a large number of decimal places.

Figure 2: Arc Tangent



The arc tangent is an angle measured in radians. By combining Gregory's formula with Euler's, users can compute pi to a large number of decimal places on an IBM PC.

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Pop, zap, whirl, buzz. Video games are to computer applications what roller coasters are to transportation: all flash and fantasy. They provide an exhilarating ride to nowhere. Just as one can become accustomed to the twists, loops, and vertiginous descents of a "Big Dipper" or "Atom Smasher," one can learn to master the strategies of a PacMan or Space Invaders with stunning displays of hand-to-eye coordination. The immense attraction of video games comes from the challenge inherent in beating the machine.

If video games are the roller coasters of computer applications, adventure games are the cross-country buses. They have a starting point and destination but normally traverse the most uninteresting route and take forever to arrive. A new territory is opening that may alter this mode of travel. The PC is becoming an instrument for the user's literary imagination, creating a new vista in the land of adventure games.

Inside Adventure Games

Adventure games usually begin with

the presentation of instructions followed by a "blind maze," a list of commands such as East, West, North, South, Up, Down, and Attack. Fleo, the player enters to the menu for commands whenever the game reaches one of its frequent dilemmas. The presentation of each dilemma recalls the format of old movie serials. Each episode of the narrative is precisely self-contained. The grand master of a well-written novel doesn't usually write an adventure game.

The "serial formula" is better suited to the movies than computers, however. The visual dimension of movies more easily draws the viewer into the narrative. Computerized serials would work better if adventure game authors developed pre-

defined narratives that captured the player's attention as a movie or a fast-paced best seller.

Most adventure game texts are terse and boring; they fail to involve the player. The player remains outside the narrative as an objective observer viewing the monotonous landscape from the window of a bus. If the narrative doesn't get him to the second bus stop, "congratulations to the rules of an unimagination game." The following excerpt provides an example:

Inspired by adventure games, a young writer proposes a revised application for the PC that would create a new literary genre.

The Next Step: Introducing The Participant Novel





PROGRAM= TAMING THE WEST
RESULT= FAILURE
CONCLUSION= GO SOAP
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SIERRA ADVENTURE



"You have entered a large, rectangular cavern. It is dimly lit. The cavern has two exits: a passage 50 feet away in the north wall and a wooden door 20 feet away in the west. No lock is visible on the door. A pile of stones blocks the east end of the cavern. More stones litter the ground. The layer of dust and dirt covering everything bears no footprints or any other traces of recent disturbance. Suddenly a noise echoes through the cavern and the ground begins to vibrate."

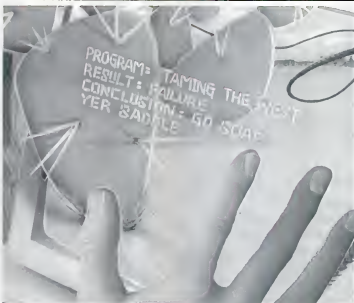
At this point the program presents a dilemma. It will prompt the player to choose one of the two exits (North or West). Both choices lead to consequences, either favorable or unfavorable. By threading through the maze of consequences from one episode to the next, the player eventually completes the game.

Many computer adventure game designers enhance the features with unexpected, often amusing responses. If a player, frustrated by an apparent dead end in the maze, types in a curse, the program may respond by cursing back via the monitor, or by taunting or soothing the embattled player.

Adventure games can be exceedingly clever and intricate. The basic problem,

T **THIS NEW** **computer genre** **combines the thrill** **of video with** **the narrative** **possibilities of the** **adventure game.**

however, is that designers do not take adequate advantage of the computer's capabilities and provide only a skeletal plot. A fiction writer attempts to grab the reader by enriching the plot with mood and feeling; adventure game programmers concentrate their talents on constructing clues and obstacles. As a result, most adventure games read like a set of instructions on how to assemble a computer. This flat, uninteresting style does not create the emotional involvement necessary to generate excitement and suspense.



The adventure game program style is similar to chess. Pleasure is derived from developing strategies and selecting moves. The thrills are almost entirely cerebral, providing a stimulating exercise in abstract thinking. But why limit the adventure game to abstract thought alone when its potential for excitement is so much greater?

The "participant novel" has been developed to take adventure games beyond the limitations of conventional programming into a new realm of experience.

Inside the Participant Novel

This computer genre combines the thrill of video with the narrative possibilities of the adventure game. The participant novel differs from an adventure game as much as a roller coaster differs from a bus. Writers, rather than programmers, develop the narratives, relying more on plot development as in a traditional novel. The narrative moves toward a single climax and attempts to create a sense of emotional involvement appropriate to the text. Players are "participants" in several senses of the word. Each player literally "plays" the role of hero or heroine, becoming totally immersed in formulating game strategy and emotionally engaged as an actual character within the narrative.

PC Software of San Diego, California, is close to completing its first participant novel for the IBM Personal Computer. The prototype participant novel includes a questionnaire in which players rate their attributes to determine a handicap based on size, strength, speed, and agility. Players enter the questionnaire data into the PC and the computer creates a protagonist based on the players' profile.

After completing the questionnaire, participants enter the narrative as a reader enters the lives and feelings of characters in a novel. Use of the second person "you" helps bridge the gap that separates players from the fictional world of the narrative. The success of the participant novel depends on the player's ability to create the illusion of being in the narrative.

The author/designer may decide to have players demonstrate their skill as warriors in battles with strange foes. Some players may be strong enough to successfully engage in hand-to-hand combat with a troll, but might be too slow and awkward to defeat a renegade elf. A player may have the speed and endurance to flee a gremlin, but lack the instinct to anticipate the attack of an oversized hawk. The game narrative can go anywhere the author directs it, challenging each player's skill.

Adventure games have been criticized

for their lack of consistency regarding direction and physical orientation. This is the result of carelessness and inattentiveness on the part of game authors. Participant novelists will have to pay closer attention to "mapping." Caverns, mountains, and cities must be laid out as if on paper. Authors will have to create reliable, consistent geographical images. If the participant novel phenomenon catches on, there will be a need for "participant editors," experts at checking computer fiction maps.

To increase excitement and involvement in participant novels, authors can adapt the capabilities of the PC to the element of time. Adverb commands such as "swiftly" or "cautiously" can be included in the novel's menu. Each command will produce a different result. Moving swiftly through a chamber may awaken a slumbering monster or it may allow entrance to a passage that would have been blocked if players had moved too cautiously. On the other hand, moving cautiously may allow them to avoid a hidden trap. Players would not know for certain how to react in either case, having to rely on intuition and clues in the text to decide on the proper speed of their movements.

Episodes in the game can have time limits that make the speed of the player's response critical. A computer signal informs players that they have entered such an episode. They may, for example, hear a rumbling in the cavern of an ogre. They

have 5 seconds to choose the escape door. If they wait too long, a cave-in may block one of the exits or even bury them under several tons of rock. This device could be even more effective if players are informed that the time allowed for their reaction is limited to an unspecified period—maybe 5 seconds or 1 minute. Forcing players to respond will heighten emotional involvement, particularly after a series of difficult confrontations.

MOVING swiftly through a chamber may awaken a slumbering monster.

Authors can adapt the time factor to battle routines. The program describes a specific attack: a downward chop with a battle ax; a side-to-side sword slash. Players must counter these movements immediately, using the appropriate move from five predetermined commands coded onto specific keys. An illogical or plodding response could be damaging or even fatal. Responding immediately to a downward chop with a straight sword thrust might wound an adversary by beating him to the punch, but a delay of 2 seconds might

mean the ax strikes home. Battle experience will refine the players' skills and improve their reactions in tense situations.

A New Literary Genre

Participant novels are not a radical departure from adventure games. They are, however, the wave of the future and there is no predicting what direction this development will take. They do not have to compete with video games. The fast moving, visual concept of video games appeals to a different type of player than adventure games.

Someone once noted that the British are a "literal" people. Americans, on the other hand, are a "visual" people. Whether or not this is true, the distinction between literal—of letters—and visual is useful. Adventure games, including the participant novel, are textual, and therefore more likely to appeal to players with literal tastes. The participant novel aspires to bring literature into the computer age, creating a new literary genre by adapting the microcomputer to traditional literary forms. It faces an uncertain, experimental, but potentially exciting future. /PC

Scott Prussing is a free-lance writer who is collaborating with PC Software to produce his first participant novel, *The Devouring Darkness*, scheduled for publication in early 1983. For more information write to PC Software, 9120 Gromercy Dr. #416, Son Diego, CA 92133.

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Grophmotic need not be limited to the boardroom. This program would be of great assistance to scientists, students, and teachers. Grophmotic can also produce brilliant color charts stored on disk for use in computer-aided instruction. The program requires a minimum of 96K, one disk drive, IBM BASIC or BASIC run-time module (BASRUN.EXE). It also requires a graphics-capable printer for hard copy output.

Ease of Use

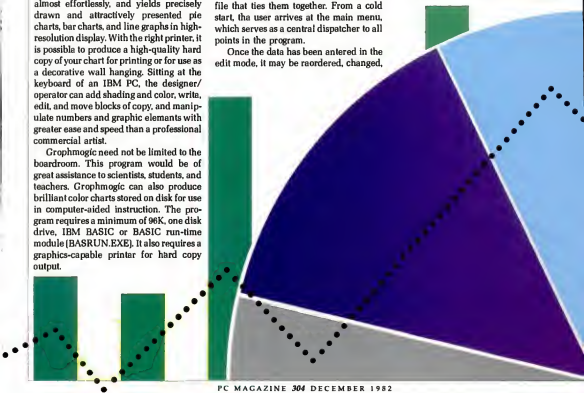
The program is run by a series of nested menus that direct the user from sign-on to entry of values, design of a graph, storage on disk, and, finally, to printing. Grophmotic will also accept data prepared by VisiCalc or any other program that stores data in the DIF format.

The manual explains how to create a master disk that will contain DOS, the Grophmotic program, the BASIC run-time module, and an AUTOEXEC.BAT file that ties them together. From a cold start, the user arrives at the main menu, which serves as a central dispatcher to all points in the program.

Once the data has been entered in the edit mode, it may be reordered, changed,

or deleted. Next, the type of graph is chosen: line, bar, or pie chart. Labels for the axes and a two-line title may be specified. The user may also choose lines with boxes marking the data points or smooth lines with the color for the area appearing below the lines on the graph. (On monochrome displays, color is translated into crosshatch patterns.) After a few quick keystrokes, the screen displays the results, which are available for printing.

In addition to data entry, as many as 30



separate steps may be involved in the design of a graph, but the process is logical and, with a little practice, reasonably quick. For example, a 12-item line graph can be produced in less than 10 minutes (plus printing time). Help menus are provided at each stage of the process.

Special Bells and Whistles

This program abounds with extra touches. It is relatively easy, for example, to overlay one chart on another. To com-

pare last winter's snowfall to this winter's, one would first draw the chart for a given year, filling the area below the line with white. Clearing the graph from the screen but keeping it tucked away in the computer's memory, one could enter new values or edit the previous ones. It's easy to change the mode of drawing to fill the area below the comparison year's area with magenta (a herringbone pattern on the monochrome display) and draw the new chart on top of the one for the previous year.

In the text entry mode, either capital letters or special characters can be entered anywhere on a graph after it has been drawn. The program also includes a math function that will calculate the total,

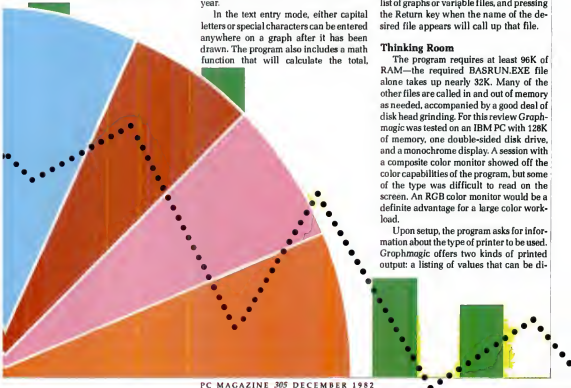
mean, mode, and median of the data entered. These calculated values can be indicated as data points on the line graph or bar chart.

Grophmagic can distinguish among the files produced by as many as nine users if a user number is entered at the beginning of each session. The disk directory for any available disk drive is accessible from within the program, and stored graphs or variable files are highlighted. Typing Ctrl N automatically steps the user through the list of graphs or variable files, and pressing the Return key when the name of the desired file appears will call up that file.

Thinking Room

The program requires at least 96K of RAM—the required BASRUN.EXE file alone takes up nearly 32K. Many of the other files are called in and out of memory as needed, accompanied by a good deal of disk head grinding. For this review Grophmagic was tested on an IBM PC with 128K of memory, one double-sided disk drive, and a monochrome display. A session with a composite color monitor showed off the color capabilities of the program, but some of the type was difficult to read on the screen. An RGB color monitor would be a definite advantage for a large color workload.

Upon setup, the program asks for information about the type of printer to be used. Grophmagic offers two kinds of printed output: a listing of values that can be di-



rected to any printer, including a daisy wheel, and a hard copy of the graph itself. The printer setup menu provides two choices for graph printing: a printer with pseudo-graphics (i.e., a standard IBM PC printer or Epson MX-80) and a printer with true graphic ability (an MX-80 with the Graftrax option). If the printer is capable of a screen dump (printing whatever image is on the screen, whether type or graphics), it should work with Grophmographic.

The program provides two methods of storing graphs: in finished form complete with graphic elements, backgrounds, and titles; or as a DIF file of the variables. Often, it may make sense to store graphs in both ways, thereby providing flexibility without sacrificing quick access.

Documentation and Packaging

The program's documentation is by no means as clear and sharply defined as the graphs it can produce. The 57-page manual seems to cover every aspect of program operation, but it takes a bit of perseverance to plow through the excessively formal and technical verbiage.

The language tends toward passive, almost bureaucratic phrasing. Take for example this sentence: "The options are accessed by pressing the key highlighted in inverse video associated with the option desired." A clearer alternative might have been: "To select an option, type in the first letter of one of the choices shown on the screen."

Want another one? Among the program's many features is the ability to have the computer automatically set the range of values on the X and Y axes, depending upon the sort of numbers entered. On the other hand, the program has a provision to override the automatic command. Here's how the manual explains how to choose the numbers: "When you want to change the range of the axes, be sure to choose 'nice' numbers for the low and high ranges. Nice numbers are numbers that will produce even, 'nice' numbers on the axis."

The on-screen prompts and the instruction manual differ drastically in quality. Did they have different creators? The saving grace of the manual is the combination glossary and index. Until the manual is improved, it might be easier to learn the program by using the glossary and on-screen menus and instructions.

File Management

Grophmographic was written using the IBM BASIC Compiler and requires that the BASIC run-time module, BASRUN.EXE, be resident on the disk to interpret the program to the computer. According to Joseph Luciano, marketing director of International Software Marketing (ISM) and one of the authors of the program, the compiler was used to increase the speed and efficiency of the program. However, after

the project was completed, ISM apparently ran into unexpected licensing difficulties with the company.

In Luciano's opinion, "IBM has been very restrictive in its release of BASRUN.EXE for independent software developers. For us to distribute Grophmographic with the module, we would have to pay IBM a licensing fee of almost half the retail price." IBM's policy is supposedly not final, and ISM and other developers were

Solving the Case of the Missing Lines

When running graphics programs, vectors sometimes vanish, lines disappear, or the wrong colors are displayed.

Running graphics programs on a standard RGB monitor such as the Amdek makes graphics appear just as they should. But hook up your PC to certain color televisions and several of the boxes become distorted, vectors vanish, and the colors become muddled. Even though hardware and software differences in various displays cause these problems, they can be solved. The included program is one solution to the case of the missing vertical lines.

From Graphics Board to Monitor

When this problem first occurred, I connected my color/graphics adapter to an oscilloscope to see what was causing the trouble. It showed that the adapter was sending the monitor a color burst of eight pulses with pulses following for each pixel (picture element) illuminated on the screen.

Inside the monitor, pixels are arranged in rows across the screen. The distance between the rows is called the band width. A circuit inside the television translates information from the color/graphics adapter into impulses that flash across the screen, illuminating the appropriate pixels. The color produced depends on the point on the pixel where the impulse strikes. Striking certain X,Y coordinates produces white, whereas other colors can be produced by striking the pixel either ahead of or behind these coordinates. Two color bits in the adapter's memory select the appropriate coordinates for the desired colors.

Horizontal lines are lost when the circuit in the monitor doesn't match the band width in the color/graphics adapter. The

impulse strikes the screen at a point where no color is produced. Differing band widths also result in production of unwanted colors.

The pixels glow for only a few microseconds and the color must be refreshed by further impulses. But if the circuits don't match, the refresh time is too long for the pixel to be visible. When this happens, vertical lines are lost.

The Solution

The obvious solution is to purchase the appropriate RGB monitor for the graphics application. Using the color white may also help prevent horizontal line loss, although the resulting colors may be red, green, or some combination thereof. Loss of vertical lines can be prevented by decreasing the time it takes for the impulse to strike the pixel on the vertical coordinate. This can be done by striking two adjacent pixels, which is what the following program does:

```
10 REM growing boxes
20 REM to illustrate a problem with the
   composite video signal in the IBM
30 REM Personal Computer's Color Graphics
   Board
40 REM by Michael Gordon
50 SCREEN 1
60 COLOR 0
70 CLS
80 FOR X=1 TO 200
90 Y=Y+1
100 LINE (X,X)-(X+Y,X+Y),1,B
110 X=X+Y+3
120 NEXT X
130 END
```

—Michael Gordon

lobbying with IBM in mid-October for reduction or elimination of the licensing fee.

Users can get BASRUN.EXE as part of IBM's \$300 BASIC Compiler package, but that's a pretty steep price to pay for a \$119.95 graphics program.

ISM includes a notice inside its Groph-magic package that diplomatically objects to IBM's policy and suggests that purchasers obtain BASRUN.EXE from dealers. Purchasers may order the module from ISM for an additional \$50.

If the user expects to use more than one program that requires the run-time module, he or she need only obtain a single copy of BASRUN.EXE and include it as part of the DOS setup for any program requiring it. As if that were not enough, ISM contributed another bit of confusion with the apparently inadvertent inclusion of the COMMAND.COM file from DOS 1.0 on the master disk. If the manual's instructions are followed, a blank disk will be formatted with DOS and the master Grophmagic disk will be copied onto it with the "COPY *.*" command. This will result in part DOS 1.0 and part DOS 1.10 and one very confused PC that won't be able to read the new disk at all.

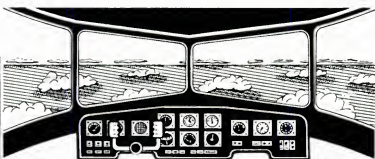
This problem will occur on directories of the Grophmagic master disk that show the COMMAND.COM file with a save date of 08-04-81. Rather than tamper with the master disk, one could copy everything but COMMAND.COM onto a newly formatted disk containing DOS 1.10. This is not a problem for DOS 1.0 users. ISM's Luciano confirmed the problem as something that programmers did not come across in testing.

The manual does not mention that the graphs each take up 16K of disk storage. A single-sided disk can store only nine graphs plus DOS, and a double-sided disk only 19. When using one double-sided disk drive, one can store several completed graphs on the program disk.

Charting a Course

Complaints about the quality of the documentation aside, this is one very impressive program for the IBM PC. It's quick and flashy and it delivers. Groph-magic is capable of making quick, easy work out of otherwise difficult or time-consuming tasks, and that's at least one reviewer's definition of a good piece of computer software.

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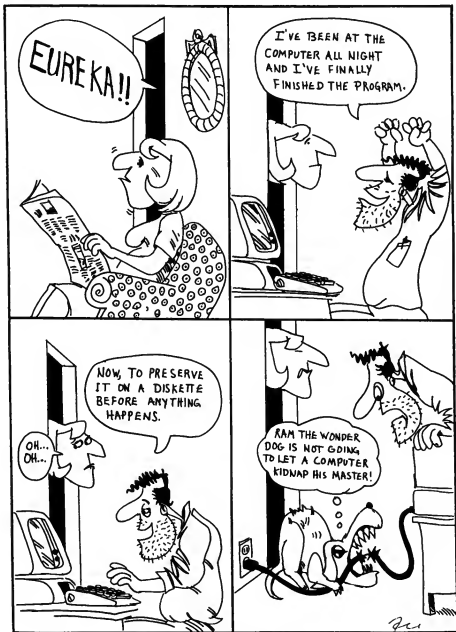
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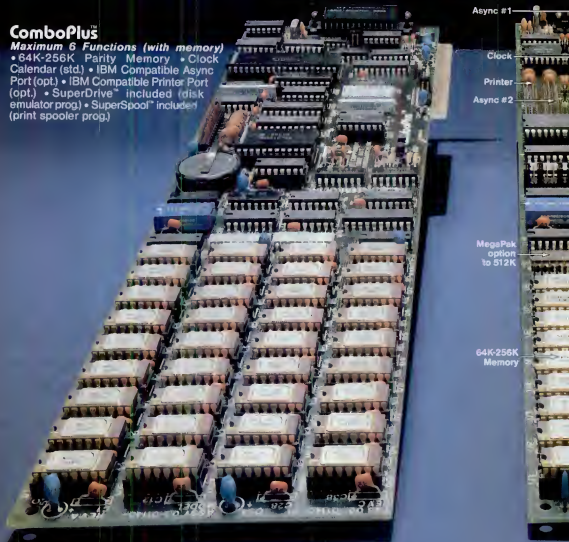
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	13	40% of capital gain distributions not reported on page 13	

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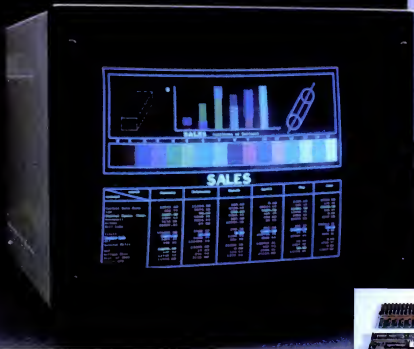
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Computers On Campus

Philip Niehoff, programmer for a PC network at the University of Wisconsin, and Terry Eikamp, accountant for one UW campus, use the PC for the business of education.

Microcomputers are beginning to proliferate among the halls of ivy. They are taking over many of the business and administrative functions that are essential to running any college. In fact, a university's operation is quite similar to a collection of small businesses, and microcomputers can help each separate unit function efficiently and communicate with the other units.

This strategy of coordinated operations is one form of management used at the University of Wisconsin (UW), where the PC has become an integral part of the business of education. The man who is primarily responsible for the PC's implementation at UW is Philip Niehoff, a first-year law student who works part time as programmer and network coordinator for the Auxiliary Operations division of the state university. Niehoff is based at the main campus of the university in Madison, but his job keeps him in contact with PC users on the institution's 12 other campuses throughout Wisconsin.



Phil Niehoff, programmer and coordinator for the PC network on the 13 campuses of the University of Wisconsin.

THE CAMPUSES
had been doing
all their paperwork
by hand.

The Auxiliary Operations division administers all self-supporting campus services, such as residence halls, food services, student unions, and bus lines. Each unit is really a small business itself, and each small business must report financial data to the central office where Niehoff works. Niehoff reports that since April 1981 Auxiliary Operations has been computerized to handle all this information efficiently. "Previous to that," he says, "the campuses had been doing all their paper-

work by hand and then mailing it to us. We were pushing it all around by hand."

An Alternative to Apples

The Auxiliary Operations staff decided to use micros several months before IBM announced the PC. "Initially we thought we'd use Apple IIIs," Niehoff recalls, "so we bought two of them, and I developed a program for budgeting. We had a fair amount of feedback from the other campuses; they wanted microcomputers, but they were not happy with the Apple III." One reason for the dissatisfaction was a series of hardware problems with the machines—problems that were always corrected but that nonetheless made the Apple III more troublesome to work with than Niehoff and his colleagues thought necessary. So Phil went looking for an alternative.

"We asked the Madison Academic Computing Center (part of the university) to do a feasibility study for us in July 1981. They looked at the program I had written

and what we wanted to do and said the Apple III would work fine, but if we could wait till October, IBM was going to announce a new microcomputer." They waited, Niehoff states, and when the PC came out, "we looked at it and were quite impressed." They ordered the computer promptly, and Niehoff's office received the first two PCs in Madison.

Although the Auxiliary Operations division planned to buy a number of PCs and other campus departments would undoubtedly be purchasing them as well, the university did not utilize IBM's offer of a discount for bulk orders. Instead, they asked the PC dealers in Wisconsin to bid for the contract to supply the computer to all state agencies. ComputerLand in Madison submitted the lowest bid, offering discounts of 20 to 27 percent on the computer and related components.

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chased 13 more. In an unusually generous step, the central Auxiliary Operations unit gave a PC system to its corresponding office on each of the 13 campuses. These free systems included a PC with 128K of RAM, two single-sided disk drives, a monochrome display, an asynchronous communications adapter, a D. C. Hayes Stack Smartmodem, and an Epson MX-100 printer. The software for each system included PC-DOS, VisiColc, and IBM's Asynchronous Communications Support Program.

Niehoff's unit worked with the first two machines before ordering this second group of PCs, and the resulting delay in delivery gave Niehoff time to convert his budgeting program from Apple's version of BASIC to PC BASIC and to write some additional software. His first step in adapting his Apple programs for the PC was to send all of the program code and data files from the Apple III via modem to the Univac 1180 mainframe computer that is used for administration on the Madison campus. Next he used a special communications program written by the Academic Computer Center to transfer all of that electronic information to the PC, again by modem. Because the PC and Apple versions of BASIC differ in some aspects, Niehoff then had to use the PC's editor, Edlin, to make the necessary changes. He completed this conversion process in about a month.

Niehoff learned BASIC by reading the manual and creating programs, and he became proficient with micros in the same way. As an undergraduate business student at UW, he took two programming courses—one in FORTRAN and one in COBOL—but he did not work with microcomputers at all. "My BASIC is self-taught," he points out, "but that was really easy because it's pretty similar to the FORTRAN we used in class, FORTRAN 77."

To date he has written the master program that each campus uses to prepare and analyze budgets for Auxiliary Operations, and he has adapted VisiColc for the campuses to do the 5-year projections that the university requires. He also wrote a bond amortization program for his division's use and a program that the food service director can use to determine future costs for vendors whose contracts include escalation clauses tied to inflation. Most recently, Niehoff has completed a com-

plex program that allows the various campus student unions to schedule meetings and events up to 2 years in advance.

"This is a computerized reservation system for the student unions," he explains. "During the day organizations or groups can reserve meeting rooms, and food service can also be tied in with that. It will take care of overnight rooms also, but that's not done very much. We may market it to other schools; we've had some interest from the University of Texas."

A Friendly Introduction

Niehoff has taken special care to make his programs easy to use, because almost everyone working with the division's 15 PCs is a newcomer to computing. "You have to make the software user-friendly," he says. "That's the most difficult part of programming. Making my budget program user-friendly almost doubled its size."

Originally, Niehoff had hoped to use an adaptation of VisiColc for budgeting instead of writing a program from scratch. But he quickly discovered that inexperienced users could botch up the program too easily. "Someone who was using it could mistakenly put a value in a cell where one of the formulas resided and

**NIEHOFF'S
office received
the first two PCs
in Madison.**

change that formula. It was just too open ended."

To help computer novices become acquainted with their new PCs, Niehoff had each campus send one or more representatives to Madison for a day of training when they picked up their computers. "We plugged in my PC to show the display on a wall monitor and gave everyone hands-on experience in how to format and copy disks, how to operate DOS, how to get from DOS to BASIC and back again, and how to use VisiColc. After they were back at their respective campuses, we gave them coaching by phone."

The acceptance of the PC and the

amount of use it gets varies among the 13 UW campuses. "Some campuses have found that they can do a lot with the computer and have gotten into programming it," says Niehoff. "Other campuses don't use it any more than they have to. That's unfortunate."

To encourage the various Auxiliary Operations units to use their PCs, he produces a newsletter that reports on his office's work with the computer, the programs he and people from other campuses have developed, and the new products for the PC. He has also initiated a software exchange so that each unit that develops a program sends him a copy; he makes it available to any other unit that requests the program. In most instances such programs are written by part-time student employees, like himself, who are especially motivated to work with micros or have prior programming experience.

Despite his disappointment that some campuses have not used their PCs very much, Niehoff is pleased with the overall performance of the computers and the work they have accomplished. So far the Auxiliary Operations division has spent some \$75,000 on PC systems, and Niehoff has no doubts about the value of that investment. "As we do more and more with the PC, the cost will become better and better justified. We really haven't taken time to do any projections to see how much we've saved by buying the PCs, mainly because it seems that every day we think of something else we can do with the computer."

A DOS Hard Disk Bug

To date Niehoff has had only one technical problem with the PCs—a bug in PC-DOS. He explains that the two PCs in his office have Davong 5-megabyte hard disks, which he will recommend for all the units as soon as the existing problem is resolved. That problem is potentially catastrophic, however: A timing error in PC-DOS (both versions 1.0 and 1.10) causes the hard disk to crash and lose all the information stored on it. The first time it happened to him he lost a program that was between 500 and 600 lines long; his most recent printout was 1 week old, so a week of new work was totally gone and he had to retype the entire program. Since then, he has taken the preventive (and tedious) measure of copying data immediately on a floppy disk after saving it on the

hard disk.

"This problem is not Davong's fault," Niehoff hastens to point out. "We know we were the first ones to discover it, because when I called Davong, they had no idea what it was. After they had sent us two replacement hard disks, they discovered that it was a software bug. They said they cannot correct the error unless they have the source code for PC-DOS, and IBM isn't going to give it to them. Davong has talked to IBM about the problem, and they said they are looking into it. This problem affects a lot of other makes of hard disks too, and I've even duplicated it on a PC


with two floppy drives. We've heard rumors about DOS 2.0; we're hoping they will have fixed the problem by the time it comes out."

Even though he has found this limitation frustrating, Niehoff is pleased about his dealings with Davong. "Davong was really good about the problem: they were on the ball and were very helpful. We were kind of surprised that they dealt directly with us, rather than having us go through ComputerLand. I'm happy that they did, however, because second- and third-hand information isn't as good as talking directly to the manufacturer."

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Niehoff's enthusiasm for the PC and for computing in general makes it obvious that he is also pleased with his part-time career as programmer and computer advocate. He notes, in fact, that the experience of the last 1½ years may alter his long-term plans. "Ever since I was a little kid, all I wanted to be was a lawyer. But now that I've found the PC, I find the two competing. I would almost rather work full time on the PC than go to law school."

A Receptive Campus

Terry Eikamp is one of the "recruits" who was introduced to microcomputers by the Auxiliary Operations program. He is an accountant for financial reporting in the Office of Budget and Finance at UW-Stout located in Menomonie, Wisconsin. He has worked as an accountant for the university for 12 years and, like Phil Niehoff, he had no experience with microcomputers until last spring, when his office got its free PC.

Eikamp says his campus is one of the more active users of the PC system and that there are now at least ten PCs at Stout. His office uses the PC for the requisite financial tasks that are part of Auxiliary Operations—budgeting and 5-year projections—but Terry and others on the Stout campus have put the PC to a variety of other uses as well. Terry's unit has written a program to do checkbook reconciliations and another to calculate repayment of student loans.

The loan program has been quite useful, Eikamp reports: "As part of the National Direct Student Loan program, we are required to provide all students with a repayment schedule when they leave school. We put in the amounts of the loans; they're at varying interest rates, so we put that in, and we calculate how much each payment will be until the loan is repaid. If the student makes timely payments, that schedule will remain in effect; if not, we can recalculate according to their late payments."

The Graphics Dimension

Terry has also added a new dimension to his Auxiliary unit's computing power. He has purchased an Amdek monitor for the PC in his office and has written programs that can create bar, line, and pie charts. At present, he uses primarily high-resolution graphics and does not use color, so that the charts can be included in re-



Terry Eikamp, an accountant and PC programmer at the Stout campus of the University of Wisconsin.

ports produced on the Epson printer. He plans to incorporate graphics in the year-end report that his office prepares.

Eikamp has done some work in color. "I did a logo of the Wisconsin badger imposed over the state. I sent that to Niehoff and he added music to it—'On Wisconsin,' of course. If we use the logo, it will be as the introduction to our own software."

Of the other PCs on the UW-Stout campus, three are used by the Continuing Education department. They have developed programs to inventory credit and noncredit courses off campus, to assign living quarters for on-campus extension courses, and to perform a break-even analysis for their courses. The break-even analysis, Eikamp explains, "includes a whole series of questions: How much is this class going to cost for the instructor? How much for travel? How much for postage? How much for advertising? All are factors that influence the cost of the course. Then they can do one of two analyses: either how many students it takes to break even or how much to charge the students who have already enrolled. That program includes some graphics as well."

The student union at Stout has also written a program that calculates bowling averages, and the Planning and Institutional Research office on the campus has developed a series of models for enrollment projections. In most instances these programs have been written by students in applied mathematics, which is one of the most highly regarded departments at this branch of the university.

Although his training is in accounting

rather than computing or applied mathematics, Eikamp has taught himself BASIC programming and has taken two classes on micros. He plans to expand his use of the PC in one significant way. He notes that he is now able to exchange information with UW's main administrative computer—the Univac 1180—in Madison, but he has not been able to communicate with the IBM 4331 mainframe located on his campus. He hopes to use some of the new IBM software for that purpose.

"We would probably be using the PC quite a bit more if we could communicate with the 4331," he predicts, "because we'd be able to draw file information off our main accounting system and manipulate it the way we want to use it. To get time or to write programs on a mainframe you usually have to go through a priority system. Getting something accomplished with a mainframe takes a lot longer than with a micro." /PC

For more information about PCs at the University of Wisconsin, contact Philip Niehoff, Auxiliary Operations Analysis, 1558 Von Hise Hall, University of Wisconsin System, Madison, WI 53706. You can also contact Terry Eikamp, Administration Building #123, University of Wisconsin-Stout, Menomonie, WI 54751.

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User-To-User

Insights, tips, and occasional bugs, as reported by the PC user community.

This month's user contributions feature a number of clever, short, and simple programs and routines that might save you steps or help get a job done. Our mailbox attests to the fact that PC users are becoming very creative with that gray box from Big Blue. It's a pleasure to be able to share this creative resource.

Incidentally, don't despair if the tip you sent in hasn't appeared yet. There's a minimum 2-month lag from the time we receive an item until it can be published, and we try to group items by subject. The contributions we've received have been uniformly first rate—keep them coming.

Recover Lost Data

I have discovered a flaw in the way DOS handles a retry after a user error. I wanted to copy some data from one disk to another. I had the disk to be copied from in drive A; but I had the wrong disk in drive B. In fact the disk in drive B was write protected. I entered the Copy command and the system gave me an error. It then asked if I wanted to Abort, Rentry, or ignore. I put the correct disk in drive B and selected Rentry. Result: The data on the disk in drive B was rendered unusable.

Further investigation revealed the following: When writing to a disk, the system apparently reads the directory, updates it in memory, and then writes it back. In the case described above, the system read the directory of the write-protected disk and updated in memory, but when it attempted to write it back out, the write protect caused an error. When I changed disks, DOS proceeded to write the directory from the write-protected disk onto the new disk, destroying the new disk's directory. Of course, most of the data was still there, but since I didn't know which sectors it was on, I could not rebuild the directory.

This problem exists with MS-DOS as distributed by IBM in both version 1.00 and 1.10.

Robert D. Scott
Cincinnati, Ohio

Diskette File Tips

Users of PC-DOS should know about managing the files and space on disks. Most people don't realize how easily the allocation of disk space can become mixed up. To remedy this situation, the DOS command Chkdsk is designed to repair any damage that has been done to file allocation. Chkdsk does a very good fix-it job. I have experimented by deliberately creating havoc on test disks, and Chkdsk has always been able to fix whatever mess I created.

The most common disk problem, by far, is that of unavailable sectors. All sectors on a disk are supposed to be either allocated to a file or free for use. But this isn't always the case. Sectors that should be available sometimes are marked as if they were in use by a file. These temporarily unavailable sectors can cause data to be lost. For example, if you were using the editor EDLIN, the file directory might indicate sufficient space on a disk for a file and the back-up copy that EDLIN automatically creates. But if some of the unused sectors were actually unavailable,

after using EDLIN to make changes to the file, you might lose your work when you tried to write the file because EDLIN could not find enough unused sectors to store it all. Users of the Pascal compiler are likely to find this problem common.

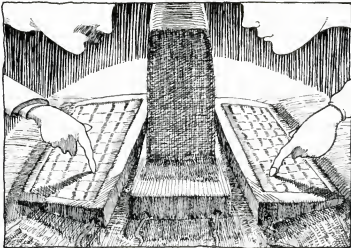
For this reason and others, performing Chkdsk routinely on your disk is valuable.

In my experience performing Chkdsk frequently is even more beneficial doing frequent file back-ups. What I do, and I recommend this to everyone, is to put Chkdsk into a batch execution file, to be done together with any edit or compile. To make Chkdsk easier to use, I have renamed it C.

Peter Norton
Venice, California

Auto-dating Batch File

Are you tired of telling your PC that it is no longer January 1, 1980? When you call the following BASIC program from an AUTOEXEC.BAT file, the system will remember the last date set. If the date hasn't changed, or if you're simply lazy, you can hit the Return key to keep the same date.



```

10 ' STARTUP
20 DIM TEXT$(100)
30 OPEN "autoexec.bat" FOR INPUT AS #1
40 NLINES=0
50 WHILE NOT EOF(1)
60 NLINES=NLINES+1:LINE INPUT
   #1:TEXT$(NLINES)
70 WEND

```

USERS OF **PC-DOS** should know about managing the files and space on disks.

```

80 CLOSE:OPEN "autoexec.bat" FOR OUTPUT
   AS #1
90 DATES=MID$(DATES,1,6)+MID
   $(DATES,9,2)
100 PRINT #1:"DATE ";DATES
110 FOR I=2 TO NLINES
120 PRINT #1:TEXT$(I)
130 NEXT
140 CLOSE:SYSTEM
150 END

```

The AUTOEXEC.BAT file must contain the following statements in order, with the first statement occupying the first line:

```

DATE 12-25-82 (any date will do)
DATE
BASIC STARTUP

```

This program takes advantage of the ability of a BASIC program to edit the batch file that called it. In this case, the program reads the AUTOEXEC.BAT file, updates the date, and then rewrites the file onto the disk.

Paul Reisberg
 Fremont, California

Printing Backspaces

It has been noted a couple of times in PC that printing CHR\$(8), the ASCII backspace character, to the screen produces a graphics character on the screen instead of moving the cursor one space to the left. This was discussed in PC Tutor (PC, August 1982) with regard to the Asynchronous Communications Support Program. The COMM-BAS program on the DOS disk deals with this problem in the following way:

```

290 BS = INKEY$: IF BS = "" THEN 320
300 ... IF BS = CHR$(8) THEN LOCATE
   ,POS(0)-1,1:PRINT " ";LOCATE
   ,POS(0)-1,1
310 PRINT #1,BS: IF ECHS="" OR
   ECHS="" THEN PRINT #2,BS:

```

(The ellipses refer to code that is not important for this discussion.) This program segment uses Locate and Pos to move the cursor back one space the character is deleted at that position but then the graphics character is printed as well. In addition, this program segment does not allow more than one backspace at a time, and it fails if a backspace is typed in the first column.

Although this backspace flaw is caused by a bug in IBM BASIC (when the backspace character is printed to the screen, it ought to move the cursor back one space), there is a very easy fix. Cursor movement is provided by printing ASCII characters 28-31 to the screen (see page G-2 of the BASIC manual). In fact, PRINT CHR\$(29) moves the cursor back one space, which is the same as what we expect from the backspace character.

If you wish to use CHR\$(8) to backspace and delete, lines 300 and 310 in the program segment above can be changed to read:

```

300 ... IF BS=CHR$(8) THEN PRINT
   CHR$(29)+""+CHR$(29):
310 PRINT #1,BS:IF (ECHS="" OR
   ECHS="" AND BS<>CHR$(8)
   THEN PRINT #2,BS:

```

Note the additional trap in 310 to prevent printing the graphics character to the screen. Similar fixes can be made to the Asynchronous Communications Support Program.

M.A. Weissman, Ph.D.
 Federal Way, Washington

Two Screen Dumps

Here is a short, simple program that produces a dot matrix graphics dump with rather impressive results. For a more rudimentary way to dump the PC's characters to print graphics in text mode, see the program by Mary Kay Winters immediately following this item.

This program prints the high-resolution graphics screen (screen 2) from the color/graphics adapter onto an Epson MX-100 printer in bit-image mode. Printing starts at the left edge of the screen on the first line and continues down the page so that the printed image is rotated 90 degrees with respect to the display. Each dot in the horizontal direction on the page is printed twice to give an aspect ratio of 1.32. Running the program through the

MOST PEOPLE
 don't realize how
 easily the allocation of
 disk space can become
 mixed up.

BASIC interpreter takes about 7 minutes to print the entire screen. (See Figure 1 for this program and Figure 2 for some sample printouts obtained with the program.)

Kevin Stee
 Marlton, New Jersey

Producing designs or bar charts on the screen is fairly easy using the Alt key and

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the available graphics symbols listed in the BASIC manual, but I was frustrated when I could not print charts on my IBM/Epson printer because it did not have Graftrax. As a rank beginner to computing shoe major occupation is programming three small humans, I have only recently discovered that the printer has its own ASCII graphics codes and that BASIC programs that use this printer require a translation.

DON'T USE the System command in an alphanumeric screen other than Screen 0.

To print designs as they appear on the screen, a subroutine similar to this one can be inserted into any program:

```
100 FOR ROW = 1 TO 25
110   FOR COL = 1 TO 80
120     X = SCREEN(ROW, COL)
130     IF X = 219 THEN X = 223: GOTO 170
140     IF X = 221 THEN X = 181: GOTO 170
150     IF X = 222 THEN X = 202: GOTO 170
160     IF X = 223 THEN X = 175: GOTO 170
170     LPRINT CHR$(X);
180   NEXT COL
190 NEXT ROW
200 RETURN
```

Mary Kay Winter
Toronto, Ontario
Canada

Two Program Aids

BASIC programs designed to take advantage of function keys F1 to F10 almost always require that the keys be redefined. Before the function keys are redefined, the original definitions of the keys are usually saved so that they can be restored when the program terminates.

Here is a technique that does not re-

quire saving the original function key definitions. This routine takes advantage of the fact that the original definitions are contained in the BASIC ROM; it retrieves the definitions from the ROM and restores them to the keys. This routine can be used as an exit routine in any BASIC program; each time a program is terminated, the original key definitions are restored and are available for later use.

Line 65000 defines the segment that is offset in the ROM area at hexadecimal address FACE. Line 65010 initializes the string variable TS (used to hold the characters of each key definition temporarily) and variable J (a pointer for the last character in TS). Line 65020 retrieves the definitions from ROM, character by character, until a null byte is encountered, signifying the end of a definition. After all the characters of a single KEY definition have been stored in TS, line 65030 is executed. This line sets the function key pointed to by K to the definition stored in TS, increments the Key pointer K, and checks to see if F10 has been defined. If not, program execution continues with line 65020 until F10 has been defined, at which time the Key On command is executed and the program terminates.

```
65000 DEF SEG = &FACE: K = 1: I = 13
65010 TS = STRING$(13, 32): J = 1
65020 T1 = PEEK(I): IF T1 < <0 THEN
MIO$(TS, J, 1) = CHR$(T1): J = J + 1:
I = I + 1: GOTO 65020
65030 KEY K, LEFT$(TS, J-1): IF K < 10 THEN
K = K + 1: I = I + 1: GOTO 65010
ELSE KEY ON: COLOR 7, 0: END
```

Gary D. Reynolds
Austin, Texas

When you are programming in BASIC, this tip can be useful, provided you have a color/graphics adapter. If you don't have a printer but you want to refer to listings from one program while working on another, use the Screen command to store portions of the reference program on pages 1, 2, or 3 of the color/graphics adapter while you program on page 0.

To use this feature, load the program you want to refer to from a tape or disk, and then type **SCREEN 0,0,1** and Enter. The display will clear, and you will be able to list up to one screenful of program lines from the reference program. To use pages

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2 or 3, type the command **SCREEN 0,0,2,2** or **SCREEN 0,0,3,3**. After the reference program has been displayed on page 1, 2, or 3, return to page 0 by typing **SCREEN 0,0,0,0**. Now erase the reference program by typing **NEW**.

Now you can load the program onto page 0, while retaining portions of the reference program on pages 1, 2, or 3. To examine any of these four pages, issue a Screen command with the appropriate page number.

An additional feature of this technique is that program lines from a reference program can be added to the working program on page 0. Do this by displaying the required line(s) on the screen, moving the cursor to the line(s) and pressing Enter. You can also type a new line number on top of the displayed line before you press Enter. When you list the working program on page 0, any program lines entered from pages 1, 2, or 3 will be included.

John A. Normile
Heber Springs, Arkansas

Return to BASIC

Before you go wild playing with the Screen paging suggestion just described, you might want to read the following cautionary words.

The PC does not always return properly from BASICA to the system when the System command is invoked. The command works fine as long as you are displaying a graphics screen or if you are displaying screen 0 in alpha mode. If you display any of the other screens with a Screen command, the compiler will leave BASIC and you will get the DOS prompt, but you will have only a single column of display. The system still works, but you cannot see what is going on. Type **DIR** and see what happens. Don't panic; there is still hope of recovery.

Type **BASICA** to go back to BASIC and don't worry if you cannot find the text. Be careful and type **SCREEN 0,1,3,3** or the equivalent for the screen number you were displaying when you entered the System command. This should put you back in business. A little trick at the end: Clear the screen with **Ctrl Home** and the labels for the soft keys will return.

Solution? Don't use the System command in an alphanumeric screen other than Screen 0. To return to the system, first go to screen 0 (typing **SCREEN 0,1,0,0** for

example) and then issue the System command.

Rather than a bug, there may only be something that needs enhancement. In any case, it shows poor design.

Fernando G. Loygorri
Seattle, Washington

Bug Hunt (Pascal)

It looks like this heading is destined to be a regular User-to-User feature, as the ranks of those ready to cry "Bug!" are still in full force. There will be a new collection of BASIC specimens in next month's issue, but it seems only fitting that the IBM Pascal Compiler should get equal time. In all fairness, even these two user-external-motors admit that, at times, it's difficult to distinguish a true bug from a crowly inelegance.

AT TIMES,
it's difficult to
distinguish a true bug
from creepy-crawly
inelegance.

I spent two very frustrating days trying to straighten out this problem. The symptoms are as follows: During pass 1 of the compiler, PAS1 is loaded into the system; then the system accesses Disk B for a few seconds. When the light goes out, the system appears to go to sleep—no messages, no activity, nothing. When I abort the compiler with **Ctrl Break**, the system returns.

The problem is that the system doesn't know the difference between a file named **BLINE PAS** and a special device named **Line**. Other systems can make this distinction. The special device names **Line** and **User** are peculiar to Pascal and reference to them is found on page 12-29 of the Pascal compiler manual. **Line** is used for the RS-232 port; **User** is for the console. There is no reference to either of these device names in the compiler manual index. The discussion in the manual implies that these are names that can be used in a user program—not files that are used by the compiler.

IBM and Microsoft may not agree that this is a bug, but it certainly caused me

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much frustration. When I was trying to write a program, Line, to draw a line from point A to point B, I certainly didn't think there was a connection between the name Line and the RS-232 port. I experimented with the word User as a file name and the same thing happened. Presumably some of the other names would cause similar results.

Carol R. Sawyer
Bainbridge Island, Washington

For a short course in Pascal bug hunting, try these size programs contributed by Rick Richards.

```
program compiler_bug_1;
{ Compiler bug 1: Compiler leaves disk in
trashy state after compiling a program
with errors in it
Symptom: Must run chkdsk after compiling
this program to release disk blocks. }
begin
  this is not a legal statement;
end.
program compiler_bug_2;
{ Compiler bug 2: Type returned by sizeof
function is not compatible with the
length argument of fillc, although both
are documented to be of type word.
Symptom: warning message produced during
compilation.
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only. }
var
  ary: array[1..10] of char;
begin
  fillc(adr ary, sizeof(ary), 'o');
end.
program compiler_bug_3(output);
{ Compiler bug 3: optimizer fails in attempt
to use value of 'temp' which is in
register DX. Look at bug3.cod to see errors
in the emitted code. Esp. MOV AX, DX
after XCHG AX, DX!
Symptom: Mod value is computed incorrectly.
Should be 1.
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only. }
```

```
var
  temp : integer;
  ary : array[1..2] of integer;
```

```
1 : integer
j : integer
begin
  temp := 5;
  j := 2;
  ary[j] := temp;
  i := temp mod 4;
  writeln(temp:1 mod 4 = '1:1');
end.
program compiler_bug_4;
{ Compiler bug 4: Compiler ignores the
evaluation order intended by use of parenthesis.
Look at bug4.cod to see if the expression
is reordered such that the subtraction
is performed before the addition.
Symptom: Result of expression below will
be calculated correctly, but will cause a
run time error since attempting to perform
the order of calculation that was
generated by the compiler will cause an
unsigned arithmetic overflow.
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```

```
var
  a, b, c : byte;
begin
  b := 0;
  c := 8;
  a := (b + 5) * (c div 2);
end.
program compiler_bug_5(output);
{ Compiler bug 5: For ... downto ... do
loops that use byte-size variables will
compile incorrectly. The loop control
variable is fetched as a word, decremented,
then the lower byte is stored back.
A conditional branch is then executed
to leave the loop on zero; however the
upper byte that was fetched may have
contained garbage that causes the loop
to continue running. Look in bug5.cod at
the bottom of the for loop in procedure
loopy to see the goof up.
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```

```
procedure loopy;
var
  i : sint;
begin
```

```
for i := 2 downto 1 do
{
  if i = 1 or else i = 2 then
    writeln('We expect this iteration')
  else
    writeln('Compiler bug 5 strikes
again!');
};
end.
procedure make garbage;
var
  g : integer;
begin
  g := 32767; (Put something nasty on stack
where loopy's i will be)
end.
begin
  make garbage;
  loopy;
end.
program compiler_bug_6(output);
{
  Compiler bug 6: compiler generates a
copy of a constant each time the constant
is used, wasting data space. Examine
bug6.cod and see that the constant MSG is
duplicated three times, once for each
writeln statement below
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only. }
```

```
const
  MSG = 'This is an output message';
begin
  writeln(MSG);
  writeln(MSG);
  writeln(MSG);
end.
```

Rick Richard
Eatontown, New Jersey

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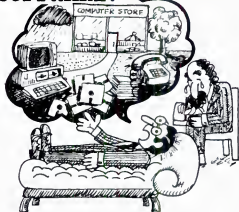
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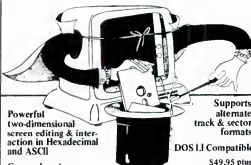
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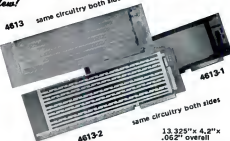
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EDITED BY SUSAN HURLEY

Club News

Clubs, bulletin boards, and newsletters enable PC users to capitalize on their fellow users' knowledge.

California

A new group, the Peninsular IBM PC Users Group, has been formed in San Carlos and holds meetings on the first Saturday of each month. The group plans to hold elections for officers soon. No dues have been set. Prospective members and speakers should contact Tex Thoman at Friendly Software Corp., 376 El Camino Real, San Carlos, CA 94070.

A special PC subgroup of the UCSD p-System User's Society [USUS] was formed at the USUS national convention in Dallas. Subgroup members share common problems and solutions for operating the p-System on the PC. Annual dues are \$20. Although plans to organize local chapters are in the works, at present the group does not hold regular meetings; members stay in contact through the newsletter and the USUS electronic mail system. For information contact USUS, P.O. Box 1148, La Jolla, CA 92038.

Florida

A new chapter of the Autumn Revolution is being formed in Sarasota. Saul Lowitt, who is helping organize the group, said approximately 20 people have been meeting informally since July. Lowitt says the group plans to organize formally and elect officers. Regular meetings have not been established. For information contact Saul Lowitt, 2131 Brookhaven Dr., Sarasota, FL 33579, (813) 921-3230.

New York

The New York IBM Personal Computer Users Group sponsors professional interest committees that explore special PC applications such as medical applications, graphics, assembly language, and UCSD Pascal. Committees meet just before the group's general meeting. The group is sponsored by the New York Amateur Computer Club and the New York City Chapter of the Association for Computing Machinery. The group's January 19th general meeting will focus on graphics applications. For information write to NYPC, c/o SYSDOC Inc., 1385 York Ave., New York, NY 10021.

Discount software and some discount hardware is available from the American Software Club. The club provides members with a bimonthly publication that includes software reviews and lists the manufacturer's price and the club's discount price. A free 6-month trial membership is available. Contact the American Software Club, Millwood, NY 10546, (800) 431-2061.

Texas

The newly created Central Texas IBM PC Users Group would like to exchange newsletters and software with other groups. Charles Weller, who is helping organize the group, said he hopes both novices and experienced PC users will join. The group meets at the Old Quarry Branch of the Austin Public Library on the first Tuesday of each month. Dues are \$35 per year. The Central Texas Group is allied with the Southwest Users Group in Dallas, and the two groups will probably exchange software and speakers. For information contact Charles Weller, 325 Explorer, Austin, TX 78734, (512) 261-6566.

The Houston Area League of PC Users will hold elections for club officers this month. The club numbers approximately 70 members, according to President Rob Taylor. Dues are \$25 a year and are prorated from June 1. Meetings are held the first Tuesday of each month. The group is "split right down the middle" between experienced and inexperienced users, according to Taylor. The club has a bulletin board and a software and hardware library and is interested in swapping software and newsletters with other clubs. Contact Rob Taylor at 8023 Shady Grove, Houston, TX 77040, (713) 937-3592.



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Communications Briefs

Long-Distance Computer Games

When people think of computer games, they usually think of little Pac Men gobbling each other up or Space Invaders being shot out of the sky in living color. The graphics and sound effects of these games are often superb. But excluding bright-eyed 13-year-olds, such arcade-style games become predictable and stale after a few hours of play.

What these games lack are the elements of ego, personality, and style that come into play when two players compete head to head. Unfortunately, two people are often unable to get together to play a game.

That's where using the PC to telecommunicate with other computers comes in. With their computers linked via phone lines, two players on opposite sides of the world can enjoy a fast-paced game. If they subscribe to an information service such as The Source or CompuServe, they don't even have to use their computers at the same time. The service's computer can remember the first player's move, store future moves and alternatives, and report the events to the second player's computer when he or she is ready to play.

The CompuServe information service offers several challenging multiplayer games of which Megawars is probably the most popular. For the cost of a local phone call plus CompuServe's \$5 per hour rate, you can get involved in complex games of strategy and skill.

Every time I have signed on to play Megawars others have been eager to play. Up to ten people from anywhere in the country can play simultaneously. Players choose which side they want to be on—the colonists (good guys) or the Kryons (bad guys). The screen of your computer is the window of your spaceship and your keyboard is your control panel. In this very fast-paced game, every time a player makes a move, it shows up immediately on everyone's screen.

The object is to wipe out the other side. You can fire rockets at the enemy or capture planets and stars. You can also send messages to the other players. If I blow up your spaceship, I might send a message saying, "Ha, I got ya, you dirty @#*!" As you become more skilled, you attain the higher ranks (admiral, captain, etc.).

Megawars players maintain a bulletin board on CompuServe on which they list updates to the game, helpful hints, and the vaults of various Megawars buffs. This bulletin board emphasizes another aspect of computer communications as a game-playing medium: You never really know anything about people at the other end. Age, sex, race, and cultural background are filtered. It is a game of mind against mind, with only the computer and some telephone lines in between.

CompuServe offers a similar interactive game called Decwars. The service offers more than 30 games, including backgammon, chess, football, and golf, that can be played on a single computer by either one or two players.

To date, nobody has written direct player-to-player games for the IBM PC. Some other computer systems, such as Radio Shack and Atari, have developed games that allow people to telephone each other directly rather than having to use an intermediary service like CompuServe. These direct games require that both players run the same game program. The programs exchange information and update each other during the course of play.

I hope someone is developing direct computer-to-computer games for the PC. These games would combine the benefits of the PC's graphics, color, and sound capabilities with the advantages of using an information service but without the service's costs. Let me know if you are developing such a game. I want to play!

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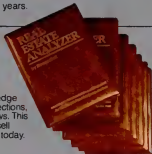
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Stumped on what to get your favorite PC user for Christmas? Following is a list of books for PC users. Everything from turning on the computer to choosing an operating system.

Armchair BASIC
Annie and David Fox
OSBORNE/McGraw-Hill
630 Bancroft Way
Berkeley, CA 94710
180 pages; \$11.95

This introduction to BASIC is aimed at beginners who do not have access to microcomputers but want to become familiar with programming concepts.

The book provides illustrations, metaphors, and examples to explain programming fundamentals applicable to any microcomputer that uses BASIC. Short descriptions of the working parts of a microcomputer are followed by a discussion on variables, data input, if/then statements, controlled loops, random numbers, read/data statements, and subroutines. A chapter on the future of computers is also included.

The authors are self-taught computer users. Together they founded the Marin Computer Center, which is open to anyone interested in personal and business applications.

BASIC Exercises for the IBM Personal Computer
J. P. Lamotier
Sybex
2344 Sixth St.
Berkeley, CA 94710
232 pages; \$13.95

Exercises for the IBM Personal Computer is a useful tool for novice BASIC programmers. The book offers programming exercises written in BASIC. Exercises include problems in tax computations, statistical calculations, and sales forecasting.

The reader is shown a step-by-step process for solving programming problems. Each exercise starts with a statement and an analysis of the problem. Suggestions follow on how to prepare a program and how to get an answer by using a flow

chart. An actual program run is presented at the end, giving users a comprehensive view of the PC's capabilities.

Some Common BASIC Programs,
IBM Personal Computer Edition
Peter M. Burke
OSBORNE/McGraw-Hill
630 Bancroft Way
Berkeley, CA 94710
195 pages; \$14.95 paperback

This book of 76 business and home management programs is aimed at PC users who want to enlarge their BASIC software libraries. Financial, statistical, home budgeting, and organization programs are included. Each of the programs is prefaced by a functional description and includes BASIC source code and operating instructions. The programs have been tested and debugged.

Novices can implement the programs since little expertise is needed. Instructions on how to tailor the programs to particular needs are also included.

Microprocessor Operating Systems
Volume II
John Zarella, Editor
Microcomputer Applications
677 Missouri St.
Fairfield, CA 94533
156 pages; \$12.95 paperback

Microprocessor Operating Systems Volume II devotes nine of its ten chapters to describing microcomputer operating systems. Each of the chapters was written by a member of the computer industry involved in the development or implementation of an operating system. The first chapter provides a general introduction to operating systems and lists reference materials. The operating systems discussed in the following chapters include Digital Research's CP/M and CP/M-86, Whitesmith's Idris, Infocsoft's I/Os (as imple-

mented by Challenge Systems), Data General's MP/AOS, and Phase One System's Multiuser OASIS and OASIS-16. Hunter and Ready's VRTX and Zilog's ZEUS operating systems are also discussed. The chapter format allows readers to compare and contrast each of the systems' capabilities.

Volume I and Volume II describe 16 microprocessor operating systems. The two volumes were designed for engineers and managers who select, evaluate, and/or design operating systems to support applications software.

Language Translators
John Zarella
Microcomputer Applications
627 Missouri St.
Fairfield, CA 94533
200 pages; \$12.95 paperback

Author John Zarella believes that there is a gap between how people perceive information and how that information is physically represented within a computer's memory system. Language translators are necessary for closing the gap between concepts and physical representations.

This book is the latest in the Microprocessor Software Engineering Concepts Series and provides an introduction for users who want to understand the functions needed to make programs executable.

The book is split into two sections. The first five chapters provide an introduction to inexperienced users on assemblers, compilers, and interpreters. The remaining six chapters, aimed at more experienced users, provide examples of lexical analysis and syntax analysis. Concepts of program source text analysis, parsing, code generation, and optimization are also explained.

Zarella states in the preface that the book should provide novice translator designers with enough background to be able to broaden their research.

/PC

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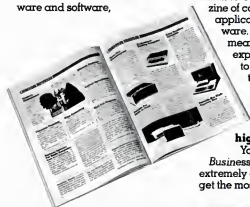
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PC MAGAZINE ANNUAL INDEX, VOLUME I

SUBJECT

Book Excerpts

Computer Choices: Beware of Conspicuous Computing. H. Dominic Covey & Neil Harding McAlister.....	#6, 179
Don't! (Or How to Core for Your Computer), Rodney Zaks.....	#1, 72
Introduction to Microcomputers, Volume 0, The Beginner's Book, David Bunnell & Adam Osborne.....	#3, 178
ViaCoke: Home and Office Companion, David M. Castlewitz & Lawrence J. Chisasky.....	#4, 203
Introduction to Word Processing, Hal Glatzer.....	#7, 328

Book Reviews

IBM Personal Computer—An Introduction to Program- ming and Applications, Larry Goldstein & Martin Goldstein.....	#4, 147
IBM Technical Reference Manual, IBM.....	#3, 139
IBM's Personal Computer, Que Corporation.....	#2, 112
Introduction to Word Processing, Hal Glatzer.....	#3, 142
Practical BASIC Programs, IBM Personal Computer Edition, Lon Poole, Ed.....	#6, 219
Trade Secrets, James Poole, Ed.....	#3, 142
WordStar Mode Easy, Walter Ettlin.....	#1, 91

Communications

Superliteracy, Clifford Barney.....	#1, 28
The Freedom Network, Jim Edlin.....	#1, 30
The Virtual Conference, Clifford Barney.....	#2, 58
Discovering The Source, Stuart R. Schwartz & Ellen Wilson.....	#3, 67
Making Your Link, Clifford Barney.....	#3, 83
Three Communications Go-Togethers, Richard Steck.....	#3, 85
PC-Talk, Lawrence J. Magid.....	#4, 143
Capturing Keystrokes, Daniel Reiner.....	#7, 232
The Link Between Word Processing and Communications.....	#7, 295

Computing

The Computer Workstead, Jeremy Joan Hewes.....	#4, 194
The Hards and Softs of Ergonomics, Richard Koffler.....	#7, 225
Making an Executive Work Station, James Becknell.....	#6, 204

Education

Revealing the Part's Tools, Dr. Edmund Skellings.....	#3, 192
Kids Teach the Teachers, Linda V. Williams.....	#6, 159

Evaluations

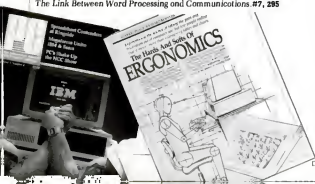
Taking the Measure, Jim Edlin & David Bunnell.....	#1, 42
Not-So-Easy Writer, Andrew Fluegelman.....	#1, 35
Coming Attractions, Dr. Larry Press.....	#1, 40
High Noon, Carl Warren.....	#2, 44
Testing T.I.M., Dr. Larry Press.....	#2, 48
T.I.M. Faces Real Life, Cheryl Woodard.....	#2, 54
User's Manual, Jeremy Joan Hewes.....	#2, 116
The Arcade Opens, Les Cowan.....	#3, 111
Cake Wars, Andrew Fluegelman.....	#4, 71
The Challenger: Multiplan, Andrew Fluegelman.....	#4, 85
PC Reviews the Smith-Corona TP-1 Printer, Frank J. Derlier.....	#4, 167
PC Takes a Look at IBM's Pascal Compiler, Dr. Larry Press.....	#4, 171
Under the Hood of the PC, Lon Poole.....	#5, 50
PC Reviews IBM COBOL, James Cowden.....	#6, 96
The Benchmark Word Processor, George D. Hughes Jr.....	#7, 109
Cost a Spell on Your Writing, Lawrence J. Magid.....	#7, 141
Color Your Keyboard.....	#7, 136
Easy Speller for Poor Spellers, Karen Phillips.....	#7, 145
The 1982 Volkswriter, Neil Zachary.....	#7, 85
The PC Gets WordStar, Danny Goodman.....	#7, 125
The PC's Keys, Jim Edlin.....	#7, 175
Personal Writing with Wordvision.....	#7, 139
A PowerText Performance, Bill Brout.....	#7, 162
Volkswriter 1.1: Camilo Wilson's Claim to Fame, Andrew Fluegelman.....	#7, 72
The Word Worker, Corey Sandler.....	#7, 83
Write-On!, Harry Miller.....	#7, 118

Events

Of Cornels and Tents, Jim Edlin.....	#4, 56
PC Goes to the US Festival photos by Brian Day.....	#6, 223
Comdex: The Year 1 PC, Jim Edlin & David Bunnell.....	#1, 55
At the Faire, Hal Glatzer.....	#3, 56
NCC Roundup, David Bunnell.....	#4, 50

Finance

How Much Are You Really Worth?, Andrew Williams.....	#4, 64
Getting Your Money's Worth, Andrew Williams.....	#5, 88
Winning the Battle of the Budget, Andrew Williams.....	#6, 146
Life Among the Bulls and Bears, Andrew Williams.....	#7, 272





Graphics

- Taking the Measure, Jim Edlin & David Bunnell #1, 42
Using Color Graphics, Lon Poole #2, 75
Music P-Cube, Karl Koessel #2, 85
Bouncin' Along With PChallenge #3, 106
Color Palettes and Color Chips, Karl Koessel #7, 305

Hardware

- PC Takes a Look at IBM's Pascal Compiler, Dr. Larry Press #4, 171

Hardware: Miscellaneous

- PC Preview: Tecmates, Jim Edlin #1, 57
Baby Blue, Lawrence J. Magid #3, 48
Product Reports, Lawrence J. Magid #3, 125

Hardware: Video

- Color Displays, Jim Edlin & Linda Thatcher #2, 66

Interviews

- Alpert, Marty #5, 30
Estridge, Don #2, 21
Fylstra, Daniel #4, 28
Gates, Bill #1, 16
Kildall, Gary #3, 32
Raburn, Vern #2, 131
Rubinstein, Seymour #7, 48
Woodard, Father Jack #6, 50

Languages

- BASIC Benchmarks, Dr. Larry Press #2, 118
Taking the Measure, Jim Edlin & David Bunnell #1, 42
Going FORTH, Eric Raymond #3, 133
PC Takes a Look at IBM's Pascal Compiler, Dr. Larry Press #4, 171
The UCSD p-System, Thomas Woteki & Alan Freiden #6, 75
PC Reviews IBM COBOL, James Cowden #6, 96
RotBAS Basics, William F. Sharpe & Brent D. Weaver #6, 121
The \$87.50 Run(around), Jim Edlin #7, 203

Legal

- How to be an Informed Buyer, K. Stewart Evans #1, 86
Cranking Up the Software Machine, Jim Strothman #2, 36
Perspectives on Protection, Hal Glatzer #2, 108
New Software Submissions Guidelines from IBM, Les Cowan #4, 185
How to Copyright Your Software (Part I), Daniel Remer #6, 168
How to Copyright Your Software (Part II), Daniel Remer #7, 264
The \$87.50 Run(around), Jim Edlin #7, 203

MarketPlace

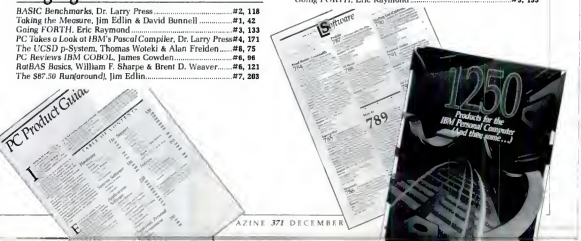
- Used Apples, Lawrence J. Magid #3, 72
The More PCs the Merrier, Jim Strothman #4, 44
Mega Forces Unite, Danny Goodman #4, 88
Becoming a Savvy Shopper, Hal Glatzer #5, 72
PC on a Budget, Lawrence J. Magid #5, 104
The Portable PC: A Preview of the Dynalogue Hyperion, Frank Defler, Jr. #7, 284
Presenting a 16-Bit Christmas #7, 365

Memory

- Memory Maximizer, Jeremy Joan Hewes #1, 82
The What, Where, and How of RAM, James Creane #6, 232

Operating Systems

- Operational Choice, Hal Glatzer #1, 50
CP/M Arrives, Jim Edlin #3, 43
Baby Blue, Lawrence J. Magid #3, 48
PC-DOS Wins One, Hal Glatzer #3, 54
Going FORTH, Eric Raymond #3, 133



Operating Systems

The Microsoft/Lifeboat Battle Cry.....	#3, 159
The B&H Question, Hal Clatzer.....	#4, 103
IBM Updates DOS to 1.10, Bob Rice.....	#4, 111
The UCSD p-System, Thomas Woteki & Alan Freiden.....	#6, 75
Concurrent CP/M-86, David B. Hughes.....	#6, 86
CP/M-86 and MS-DOS: A Comparative Analysis, David B. Hughes.....	#7, 181

Printers

Color Printers, Jim Edlin & Linda Thatcher.....	#2, 71
PC Reviews the Smith-Corona TP-1 Printer, Frank J. Derfler.....	#4, 167
How to Choose a Letter Quality Printer, Jeremy Joan Hewes.....	#7, 148
Dot Matrix and the Written Word, Corey Sandler.....	#7, 222
The PC Speed Test for Printers, Jeremy Joan Hughes.....	#7, 243

PC Product Guide

Applications Software.....	#5, 220
Educational, Personal, and Entertainment Software.....	#5, 290
Hardware.....	#5, 116
Systems Software.....	#5, 186
Support.....	#5, 320
1982 Products and Then Some for the IBM PC.....	#5, 113

PC Profiles

Fluegelman, Andrew.....	#1, 84
Herron, Diane.....	#4, 125
Hiten, Rick.....	#4, 313
Hoerner, Charlie.....	#2, 89
Johnson, Nelson.....	#6, 241
Merchant, Fred.....	#3, 147
Moornet, Gary.....	#2, 89

Programming

Cranking Up the Software Machine, Jim Strothman.....	#2, 38
Using Color Graphics, Lon Poole.....	#2, 75
Magic P-Cube, Karl Koessel.....	#2, 85
Bouncin' Along With P-Challenge, Karl Koessel.....	#3, 108
Beginner's Guide to Strings, Steven Cook.....	#5, 377
PC Profiling, Peter Rowley.....	#6, 102
Using Data Files, B. Boasso.....	#6, 102
A Program Tool for the Programmer, Karen Phillips.....	#6, 131
Color Palettes and Color Chips, Karl Koessel.....	#7, 305

Software: Data Base Management

Testing T.I.M., Dr. Larry Press.....	#2, 46
T.I.M. Faces Real Life, Cheryl Woodard.....	#2, 54

Software: Games

Bouncin' Along With P-Challenge, Karl Koessel.....	#3, 108
The Arcade Opens, Les Cowan.....	#3, 111
Gamesware Coming, But, Carl Warren.....	#1, 32
Magic P-Cube, Karl Koessel.....	#2, 85
Moth Comes, D. H. Cabbage.....	#2, 100

Software: Miscellaneous

PC Preview: Mothmagic, Jim Edlin.....	#1, 58
Life Among the Bulls and Beers, Andrew Williams.....	#7, 272

Software: Spreadsheets

VISI-1040, David Bunnell.....	#1, 84
How Much Are You Really Worth?, Andrew Williams.....	#4, 64
Calc Wars, Andrew Fluegelman.....	#4, 71
The Challenge: Multiplan, Andrew Fluegelman.....	#4, 85
Winning the Battle of the Budget, Andrew Williams.....	#6, 146

Word Processing

The Benchmark Word Processor, George D. Hughes, Jr.....	#7, 106
Capturing Keystrokes, Daniel Remet.....	#7, 232
Cost a Spell on Your Writing, Lawrence J. Magid.....	#7, 141
Color Your Keyboard.....	#7, 136
Dot Matrix and the Written Word, Corey Sandler.....	#7, 222
Easy Spelling for Poor Spellers, Karen Phillips.....	#7, 145
EasyWriter Resurrected, Andrew Fluegelman.....	#4, 180
EasyWriter Update Coming, Jim Edlin.....	#2, 114
Equipping Your IBM PC for Word Processing, Corey Sandler.....	#7, 195
In Search of a Word Processing Program, Dr. Larry Press.....	#7, 206
The Link Between Word Processing and Com- munications, Frank Derfler.....	#7, 295
The 1982 Volkswriter, Neil Zachary.....	#7, 85
Not-So-Easy Writer, Andrew Fluegelman.....	#1, 35
PC Focuses on Word Processing.....	#7, 71
The PC Gets WordStar, Danny Goodman.....	#7, 125
PC Magazine Guide to Word Processing Programs.....	#7, F-2
Personal Writing with Wordvision.....	#7, 138
A PowerText Performance, Bill Crout.....	#7, 102
Product Reports, Lawrence J. Magid.....	#3, 125
A Solution to the EDLIN Blues.....	#6, 115
User-Friendly Word Processors: The Iron Hand in the Velvet Glove, Clifford Barney.....	#7, 286
Volkswriter 1.1: Camilo Wilson's Claim to Fame, Andrew Fluegelman.....	#7, 72
Word Processing As a Profession, Janet McCandless.....	#7, 246
The Word Worker, Corey Sandler.....	#7, 83
Write-On!, Harry Miller.....	#7, 118

AUTHOR

Barney, Clifford, Moking Your Link.....	#3, 83
Communications Briefs Superliteracy.....	#1, 26
User-Friendly Word Processors: The Iron Hand in the Velvet Glove.....	#7, 286
The Virtual Conference.....	#2, 58
Becknell, James C., Moking on Executive Work Station.....	#6, 204





Winning the Battle of the Budget

PC at the US Festival



Bunnell, David, Boca Diary.....	#2, 21
Cowboy Publishing.....	#2, 11
Flying Upside Down.....	#1, 10
For 10 Minutes PC Was Free.....	#3, 19
From the Publishing Jungle.....	#4, 17
The Man Behind the Machine.....	#1, 16
Microsoft's Vern Rouben.....	#2, 131
NCG Roundup.....	#4, 50
Take Charge of Your Pochyterm.....	#6, 23
Tecmar's Triumph: A Decade of Success.....	#5, 30
Visi-100.....	#1, 84
When Wildly Optimistic Isn't Enough.....	#5, 17
Bunnell, David & Currie, Eddie, Context of the Revolution.....	#2, 138
The Grand & Glorious Crusade.....	#4, 219
The Keys to the Kingdom.....	#8, 289
The Quiet Revolution.....	#1, 88
Soldier to the Right of Them, Soldier to the Left of Them.....	#3, 175
The Strange Case of Eddie Smith.....	#7, 347
Bunnell, David & Edlin, Jim, Comdex: The Year 1 PC.....	#1, 54
CP/M's Creator.....	#3, 32
Taking the Measure (Part I).....	#1, 42
Bunnell, David & Magid, Lawrence J., An Interview with VisiCalc Entrepreneur Daniel Fylstra.....	#4, 26
Bunnell, David & Osborne, Adam, How Not to Choose a Microcomputer.....	#3, 178
Cabbage, D. H., Math Games.....	#2, 100
Castlewitz, David & Chisansky, Lawrence J., VisiCalc: Your Stock Portfolio.....	#4, 203
Cook, Steven, Beginner's Guide to Strings.....	#5, 377
Convey, H. Dominic & McAllister, Neil Harding, Computer Choices: Beware of Conspicuous Computing.....	#6, 176
Cowan, Les, A Team-Written PC Overview.....	#2, 112
A Tool for the Layperson.....	#4, 147
The Arcade Opens.....	#3, 111
New Software Submissions Guidelines from IBM.....	#4, 185
Practical BASIC Programs.....	#6, 219
WordStar Made Easy.....	#1, 91
Cowden, James H., PC Reviews IBM COBOL.....	#6, 96
Crosane, James, The What, Where, and How of RAM.....	#6, 232
Currie, Eddie & Bunnell, David, Context of the Revolution.....	#2, 138
The Grand & Glorious Crusade.....	#4, 219
The Keys to the Kingdom.....	#8, 289
The Quiet Revolution.....	#1, 88
Soldier to the Right of Them, Soldier to the Left of Them.....	#3, 175
The Strange Case of Eddie Smith.....	#7, 347
Derfler, Frank J., Jr., The Link Between Word Processing and Communications.....	#7, 295
PC Reviews the Smith-Corona TP-1 Printer.....	#4, 167
The Portable PC: A Preview of the Dynalogue Hyperion.....	#7, 284
Edlin, Jim, CP/M Arrives.....	#3, 43
EasyWriter Update Coming.....	#2, 114
The \$87.50 Runaround.....	#7, 203
The Freedom Network.....	#1, 30
Making the Elephant Tap Dance.....	#6, 63
Of Camels and Tents.....	#4, 56
PC Preview: Mathemagic.....	#1, 58
PC Preview: Tecmates.....	#1, 57
The PC's Keys.....	#7, 175
Confessions of a Convert.....	#1, 12
The Monochrome Mistake.....	#2, 12
Applying PC Power.....	#3, 22
Save the Cracks.....	#4, 18
A Tale of Two Cultures.....	#5, 18
C.S.....	#6, 25

Boasso, B., Using Data Files.....	#3, 91
Using Data Files.....	#6, 109
Edlin, Jim & Bunnell, David, CP/M's Creator.....	#3, 32
Comdex: The Year 1 PC.....	#1, 54
Taking the Measure (Part II).....	#1, 42
Edlin, Jim & Thatcher, Linda, Color Displays.....	#2, 66
Evans, K. Stewart Jr., How to Be an Informed Buyer.....	#1, 86
PCounsel.....	#3, 203
Fluegelman, Andrew, Calc Wars.....	#4, 71
The Challenger: Multiplan.....	#4, 85
EasyWriter Resurrected.....	#4, 180
Not-So-Easy Writer.....	#1, 35
Volkswriter 1.1: Camilo Wilson's Claim to Fame.....	#7, 72
Freiden, Alan & Woteki, Thomas, The UCSD p-System.....	#6, 75
Glatzer, Hal, At the Fair.....	#3, 56
Becoming a Savvy Shopper: Do Computers Really "Solve" Problems?.....	#5, 72
The Bithead Question.....	#4, 183
Operational Choice.....	#1, 50
Perspective on Protection.....	#2, 108
PC-DOS Wins One.....	#3, 54
Writing and Editing with a Word Processor.....	#7, 328
Goodman, Danny, Mega Forces Unite.....	#4, 88
The PC Gets WordStar.....	#7, 125
Groat, Bill, A PowerText Performance.....	#7, 102
Hewes, Jeremy Joan, A Cigar-Factory PC and the VisiCalc Soccer Standings.....	#7, 313
The Computer That's Literally for the Birds.....	#4, 125
The Computer Workstead.....	#4, 194
How to Choose a Letter Quality Printer.....	#7, 148
Memory Maximizer.....	#1, 82
The PC Comes of Age for Architects.....	#6, 211
PC for a Publisher.....	#1, 64
The PC Speed Test for Printers.....	#7, 243
A Tale of Two Beginnings.....	#2, 89
User's Manual.....	#2, 116
Walking Through the Open Door.....	#3, 147
Hughes, David B., CP/M-86 and MS-DOS: A Comparative Analysis.....	#7, 181
Concurrent CP/M-86.....	#6, 88
Hughes, George D., The Benchmark Word Processor.....	#7, 109
Koussell, Karl, Bouncing Along with PChallenge.....	#3, 108
Color Palettes and Color Chips.....	#7, 305
Magic PCube.....	#2, 85

AUTHOR

Koffler, Richard, <i>The Hards and Softs of Ergonomics</i>	#7, 225
Leibson, Steve, <i>A Solution to the EDLIN Blues</i>	#6, 115
Magid, Lawrence J., <i>Baby Blue</i>	#3, 48
Cast a Spell on Your Writing.....	#7, 141
The Kingpin of Micro.....	#7, 141
PC on a Budget.....	#5, 104
PC-Talk.....	#4, 143
Used Apples.....	#3, 72
Product Reports.....	#3, 125
Magid, Lawrence J. & Bunnell, David, <i>An Interview with VisiCalc Entrepreneur Daniel Fylstro</i>	#4, 28
McAlister, Neil Harding & Covey, H. Dominic, <i>Computer Choices: Beware of Conspicuous Computing</i>	#6, 178
McCandless, Janet, <i>Word Processing as a Profession</i>	#7, 246
McEntine, Norman, <i>The Key to the PC</i>	#3, 139
Miller, Harry, <i>Write-On!</i>	#7, 118
Osborne, Adam & Bunnell, David, <i>How Not to Choose a Microcomputer</i>	#3, 178
Phillips, Karen, <i>Easy Spelling for Poor Spellers</i>	#7, 145
A Program Tool for the Programmer.....	#6, 131
Poole, Lon, <i>Easy-As-Pie Charts</i>	#3, 97
Under the Hood of the PC.....	#5, 58
Using Color Graphics.....	#2, 75
Press, Dr. Larry, <i>Basic Benchmarks</i>	#2, 118
Coming Attractions.....	#1, 40
In Search of a Word Processing System.....	#7, 280
PC Takes a Look at IBM's Pascal Compiler.....	#4, 171
Testing T.I.M.....	#2, 48
Raymond, Eric, <i>Going FORTH</i>	#3, 133
Remer, Daniel, <i>Capturing Keystrokes</i>	#7, 232
How to Copyright Your Software (Part One).....	#6, 168
How to Copyright Your Software (Part Two).....	#7, 264
Rice, Bob, <i>IBM Updates DOS to 1.10</i>	#4, 111
Rowley, Peter, <i>PC Profiling</i>	#6, 102
Sandler, Corey, <i>Dot Matrix and The Written Word</i>	#7, 222
Equipping Your IBM PC for Word Processing.....	#7, 195
The Word Worker.....	#7, 93
Schwartz, Stuart & Wilson, Ellen, <i>Discovering The Source</i>	#3, 67
Sharpe, William F. & Weaver, Brent D., <i>RatBAS Basics</i>	#6, 121
Skellings, Dr. Edmund, <i>Revealing the Poe's Tools</i>	#3, 192
Steck, Richard, <i>Three Communications Co-Togethers</i>	#3, 85
Strathman, Jim, <i>Crunking Up the Software Machine</i>	#2, 36
The More PCs the Merrier.....	#4, 44
Thatcher, Linda & Edlin, Jim, <i>Color Displays</i>	#2, 86
Thomas, Dr. Rebecca & Yates, Jean, <i>The Visi-Calculator Dream Machine</i>	#4, 145
What Do You Do with All Those Computers?.....	#1, 62
Warren, Carl, <i>Gameware Coming, But</i>	#1, 32
High Noon.....	#2, 44
Williams, Andrew, <i>Getting Your Money's Worth</i>	#5, 88
How Much Are You Really Worth?.....	#4, 64
Life Among the Bulls and Bears.....	#7, 272
Winning the Battle of the Budget.....	#6, 146
Williams, Linda V., <i>Kids Teach the Teachers</i>	#6, 159
Wilson, Ellen & Schwartz, Stuart, <i>Discovering The Source</i>	#3, 67
Woodard, Cheryl, <i>A PC Revises the Bible</i>	#6, 50
T.I.M. Faces Real Life.....	#2, 54
Woteki, Thomas & Freiden, Alan, <i>The UCSD p-System</i>	#6, 75
Yates, Jean & Thomas, Dr. Rebecca, <i>The Visi-Calculator Dream Machine</i>	#4, 145
What Do You Do with All Those Computers?.....	#1, 62
Zachary, Neil, <i>The 1982 Volkswriter</i>	#7, 85
Zaks, Rodney, <i>Don't (Or How to Care for Your Computer)</i>	#1, 72

TITLE

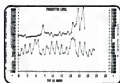
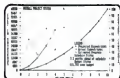
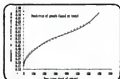
The Arcade Opens, Cowan, Les.....	#3, 111
At the Fair, Glatzer, Hal.....	#3, 58
Applying PC Power, Edlin, Jim.....	#3, 22
Baby Blue, Magid, Lawrence J.....	#3, 48
Basic Benchmarks, Press, Dr. Larry.....	#2, 118
Becoming a Savvy Shopper, Glatzer, Hal.....	#5, 72
Beginner's Guide to Strings, Cook, Steven.....	#5, 377
The Benchmark Word Processor, Hughes, George D. Jr.....	#7, 189
The Bithead Question, Glatzer, Hal.....	#4, 103
Boco Diary, Bunnell, David.....	#2, 21
Boucin' Along with PChallenge, Koessel, Karl.....	#3, 108
Cule Wars, Fluegelman, Andrew.....	#4, 71
Capturing Keystrokes, Remer, Daniel.....	#7, 232
Cast a Spell on Your Writing, Magid, Lawrence J.....	#7, 141
The Challenger: Multiplication, Fluegelman, Andrew.....	#4, 85
A Cigar-Factory PC and the VisiCalc Soccer Standing, Hewes, Jeremy Joan.....	#7, 313
Color Pallettes and Color Chips, Koessel, Karl.....	#7, 305
Color Your Keyboard.....	#7, 136
Color Displays, Edlin, Jim & Thatcher, Linda.....	#2, 86
Complex: The Year 1 PC, Edlin, Jim & Bunnell, David.....	#1, 54
Coming Attractions, Press, Dr. Larry.....	#1, 40
The Computer That's Literally for the Birds, Hewes, Jeremy Joan.....	#4, 125
The Computer Workstead, Hewes, Jeremy Joan.....	#4, 184
Concurrent CP/M-86, Hughes, David B.....	#6, 88
Confessions of a Convert, Edlin, Jim.....	#1, 12
Context of the Revolution, Bunnell, David & Currie, Eddie.....	#2, 138
Cowboy Publishing, Bunnell, David.....	#2, 11
CP/M Arrives, Edlin, Jim.....	#3, 43
CP/M-86 and MS-DOS: A Comparative Analysis, Hughes, David B.....	#7, 181
CP/M's Creator, Bunnell, David & Edlin, Jim.....	#3, 32
Crunking Up the Software Machine, Strathman, Jim.....	#2, 36
C.S., Edlin, Jim.....	#6, 25
Discovering The Source, Schwartz, Stuart & Wilson, Ellen.....	#3, 67
Don't (Or How to Care for Your Computer), Zaks, Rodney.....	#1, 72
Dot Matrix and the Written Word, Sandler, Corey.....	#7, 222
Easy-As-Pie Charts, Poole, Lon.....	#3, 97
Easy Spelling for Poor Spellers, Phillips, Karen.....	#7, 145
EasyWriter Resurrected, Fluegelman, Andrew.....	#4, 180
EasyWriter Update Coming, Edlin, Jim.....	#2, 114
The \$87.50 Runaround, Edlin, Jim.....	#7, 283
Equipping Your IBM PC for Word Processing, Sandler, Corey.....	#7, 195
Flying Upside Down, Bunnell, David.....	#1, 10
For 10 Minutes PC Was Free, Bunnell, David.....	#3, 19
The Freedom Network, Edlin, Jim.....	#1, 30
From the Publishing Jungle, Bunnell, David.....	#4, 17

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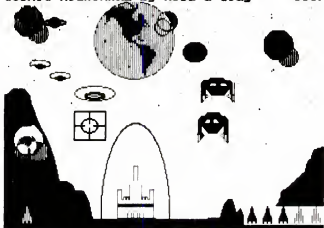
Gomewere Coming, But, Warren, Carl.....	#1, 32
Getting Your Money's Worth, Williams, Andrew.....	#5, 88
Coing FORTH, Raymond, Eric.....	#3, 133
The Grand and Glorious Crusade, Bunnell, David & Currie, Eddie.....	#4, 219
The Hords and Softs of Ergonomics, Koffler, Richard.....	#7, 225
High Noon, Warren, Carl.....	#2, 44
How Much Are You Really Worth?, Williams, Andrew.....	#4, 64
How Not to Choose a Microcomputer, Bunnell, David & Osborne Adam.....	#3, 178
How to Be an Informed Buyer, Evans, K. Stewart.....	#1, 86
How to Choose a Letter Quality Printer, Hewes, Jeremy Joan.....	#78, 148
How to Copyright Your Software (Part I), Remer, Daniel.....	#6, 168
How to Copyright Your Software (Part II), Remer, Daniel.....	#7, 264
Humanizing Technology and Computerizing People, Convey, H. Dominic & McAlister, Neil Harding.....	#5, 178
IBM Updates DOS to 1.10, Rice, Bob.....	#4, 111
In Search of a Word Processing Program, Press, Dr. Larry.....	#7, 208
An Interview With VisiCalc Entrepreneur Daniel Fylstra, Bunnell, David & Magid, Lawrence J.....	#4, 28
The Key to the PC, McEntire, Norman.....	#3, 139
The Keys to the Kingdom, Bunnell, David & Currie, Eddie.....	#6, 289
Kids Teach the Teachers, Williams, Linda V.....	#6, 159
The Kingpin of MicroPro, Magid, Lawrence J.....	#7, 46
Life Among the Bulls and Bears, Williams, Andrew.....	#7, 272
The Link Between Word Processing and Communications, Derfler, Frank J., Jr.....	#7, 295
Magic PC Cube, Kossel, Karl.....	#2, 85
Making an Executive Work Station, Becknell, James G.....	#6, 204
Making the Elephant Tap Dance, Edlin, Jim.....	#6, 63
Making Your Link, Barney, Clifford.....	#3, 83
The Man Behind the Machine, Bunnell, David.....	#1, 16
Moth Cakes, Cabbage, D. H.....	#2, 100
Mega Files Unite, Goodman, Danny.....	#4, 88
Memory Maximizer, Hewes, Jeremy Joan.....	#1, 82
The Microsoft/Lifeboat Battle Cry.....	#3, 159
Microsoft's Vern Raburn, Bunnell, David.....	#2, 131
The Monochrome Mistake, Edlin, Jim.....	#2, 12
The More PC's the Merrier, Strothman, Jim.....	#4, 44
NCC Roundup, Bunnell, David.....	#4, 50
New Software Submissions Guidelines from IBM, Cowan Les.....	#4, 185
The 1982 Volkswriter, Zachary, Neil.....	#7, 85
Not-So-Easy Writer, Fluegelman, Andrew.....	#1, 35
Of Cornels and Tents, Edlin, Jim.....	#4, 56
Operational Choice, Glatzer, Hal.....	#1, 50
PCounsel, Evans, K. Stewart Jr.....	#3, 203
The PC Comes of Age for Architects, Hewes, Jeremy Joan.....	#6, 211
PC-DOS Wins One, Glatzer, Hal.....	#3, 54
PC Focuses on Word Processing.....	#7, 71
PC for a Publisher, Hewes, Jeremy Joan.....	#1, 64
The PC Gets WordStar, Goodman, Danny.....	#7, 125
PC Goes to the US Festival, Day, Brian (photos).....	#6, 223
PC Magazine Guide to Word Processing Programs.....	#7, 223
PC On a Budget, Magid, Lawrence J.....	#5, 104
PC Preview: Mathmagic, Edlin, Jim.....	#1, 58
PC Preview: Tecnotes, Edlin, Jim.....	#1, 57
PC Profiling, Rowley, Peter.....	#6, 102

PC Reviews IBM COBOL, Cowden, James H.....	#6, 96
PC Reviews the Smith-Corona TP-1 Printer, Derfler, Frank J., Jr.....	#4, 167
A PC Revises the Bible, Woodward, Cheryl.....	#6, 50
The PC Speed Test for Printers, Hewes, Jeremy Joan.....	#7, 243
PC Takes a Look at IBM's Pascal Compiler, Press, Dr. Larry.....	#4, 171
PC-Talk, Magid, Lawrence J.....	#4, 143
The PC's Keys, Edlin, Jim.....	#7, 175
Personal Writing with Wordvision.....	#7, 136
Perspectives on Protection, Clatzer, Hal.....	#2, 106
The Portable PC: A Preview of the Dynologic Hyperion, Derfler, Frank J.....	#7, 284
A PowerText Performance, Groat, Bill.....	#7, 102
Practical BASIC Programs, Cowan, Les.....	#6, 219
Presenting a 16-Bit Christmas.....	#7, 365
Product Reports, Magid, Lawrence J.....	#3, 125
A Program Tool for the Programmer, Phillips, Karen.....	#6, 131
The Quiet Revolution, Bunnell, David & Currie, Eddie.....	#1, 66
RutBAS Basics, Sharpe, William F. & Weaver, Brent D.....	#6, 121
Revealing the Poets' Tools, Skellings, Dr. Edmund.....	#3, 162
Save the Crocks, Edlin, Jim.....	#4, 145
Solder to the Right of Them, Solder to the Left of Them, Bunnell, David & Currie, Eddie.....	#3, 175
A Solution to the EDLIN Blues, Leibson, Steve.....	#6, 115
The Strange Case of Eddie Smith, Bunnell, David & Currie, Eddie.....	#7, 347
Superliteracy, Barney, Clifford.....	#1, 28
T.I.M. Focus Real Life, Woodward, Cheryl.....	#2, 54
Take Charge of Your Pochyderm, Bunnell, David.....	#6, 23
Taking the Measure, Edlin, Jim & Bunnell, David.....	#1, 42
A Tale of Two Beginnings, Hewes, Jeremy Joan.....	#2, 68
A Tale of Two Cultures, Edlin, Jim.....	#5, 16
A Team-Written PC Overview, Cowan, Les.....	#2, 112
Tecmor's Triumph: A Decade of Success, Bunnell, David.....	#5, 30
Testing T.I.M., Press, Dr. Larry.....	#2, 48
Three Communications Go-Togethers, Steck, Richard.....	#3, 85
A Tool for the Laysperson, Cowan, Les.....	#4, 147
1250 Products and Then Some for the IBM PC, PC Staff.....	#5, 113
The UCSD p-System, Woteki, Thomas H. & Freiden, Alan.....	#6, 75
Under the Hood of the PC, Poole, Lon.....	#5, 50
Used Apples, Magid, Lawrence J.....	#3, 72
User-Friendly Word Processors: The Iron Hand in the Velvet Glove, Barney, Clifford.....	#7, 288
User's Manual, Hewes, Jeremy Joan.....	#2, 116
Using Color Graphics, Poole, Lon.....	#2, 75
Using Doto Files (Part I), Boasso, B.....	#3, 61
Using Doto Files (Part II), Boasso, B.....	#6, 109
The Virtual Conference, Barney, Clifford.....	#2, 58
The Visi-Calculator Dream Machine, Yates, Jean & Thomas, Dr. Rebecca.....	#4, 145
Visi-1040, Bunnell, David.....	#1, 84
Visicure and Your Stock Portfolio, Castlewitz, David M. & Chaisky, Lawrence J.....	#4, 203
Volkswriter 1.1: Comilo Wilson's Claim to Fame, Fluegelman, Andrew.....	#7, 72
Walking Through the Open Door, Hewes, Jeremy Joan.....	#3, 147
What Do You Do With All Those Computers?, Yates, Jean & Thomas, Dr. Rebecca.....	#1, 62
The Whot, Where, and How of RAM, Creane, James.....	#6, 232
When Wildly Optimistic Isn't Enough, Bunnell, David.....	#5, 17
Winning the Battle of the Budget, Williams, Andrew.....	#6, 146
Word Processing as a Profession, McCandless, Janet.....	#7, 246
The Word Worker, Sandler, Corey.....	#7, 83
Write-On!, Miller, Harry.....	#7, 116
Writing and Editing with a Word Processor, Glatzer, Hal.....	#7, 326

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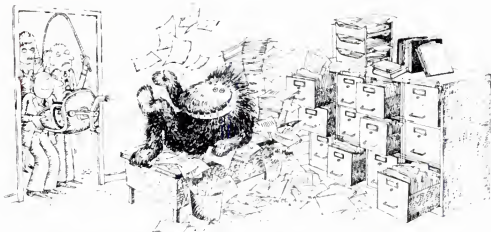
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HARDWARE

VersaWriter Digitizer

A drawing tablet that plugs into the PC game control adapter. Users can enter graphics to the PC's 320x200 and 640x200 screens. No expansion slot space is required, and more than 30 graphics commands and 100 color options are available. Graphics can be saved on disk and printed as hard copy on an MX-80 FT printer. (List Price: \$289 including software) Versa Computing, Inc. 3541 Old Conejo Rd. #104 Newbury Park, CA 91320 (805) 498-1956

Memory Boards

Four RAM memory expansion boards with parity. Board model numbers are DM-64 (for 64K), DM-128K, DM-192, and DM-256. (List Price: 64K \$395; 128K \$580; 192K \$785; 256K \$980) Datamoc Computer Systems 680 Almonor Ave. Sunnyvale, CA 94086 (408) 735-0323

Combo Board

A memory expansion/asynchronous communications controller board that has up to 256K of memory and is configured with either one or two asynchronous communications devices.

The board can free up expansion and I/O slots so users can add on other board functions. The fully upgradeable board can be configured from 64K to 256K bytes with parity and is available with 0, 1, or 2 asynchronous communications

controllers. Memory and asynchronous upgrade kits are also available. (List Price: \$550-\$1,239, depending on configuration) Datamoc Computer Systems 680 Almonor Ave. Sunnyvale, CA 94086 (408) 735-0323

Data-Leggett

An adjustable, free-standing data entry station with a height-adjustable video display platform and a slanted, adjustable copy-holder platform that places copy directly before the user. Optional side shelves provide additional work space. (List Price: \$169) HSP Computer Furniture P.O. Box 5545 Birmingham, AL 35207 (205) 251-0500

Visionary 100

A microprocessor-controlled data communications device that has a built-in modem. The device provides direct computer-to-computer communications over public telephone lines and operates independently of the PC-host. The device has its own communications capability and can send and receive messages without any intervention by the user or PC-host. (List Price: \$595 including software) Requires: EIA RS-232 interface. Visionary Electronics 141 Parker Ave. San Francisco, CA 94118 (415) 751-2903

Instor pc-8

A disk system that provides up to 2.4 million bytes of removable

data storage. It allows for compatibility in the transfer of data between the PC and larger IBM computers. The Instor pc-8 includes an 8-inch removable disk and the ability to format data from the PC on disk in IBM Basic Data Exchange standard.

The system also includes sin-

data points and graph titles. The graph becomes part of the text file and can be edited and printed as a normal page. Associated Technology Software Rt. 2 Box 448 Estill Springs, TN 37330 (205) 837-4718



Money Decisions Volume II, Eagle Software Publishing

gle- or dual-, half-height disk drives and a utility package to convert data from one disk format to another. The Instor pc-8 stands alongside the PC. (List Price: One-disk-drive system \$1,795, two-disk-drive system \$2,495) Instor Corporation 175 Jefferson Dr. Menlo Park, CA 94025 (415) 326-9830

Word Processor Graph Paper

A software program that produces screen formats of standard graph paper grids, compatible with word processor storage formats. Users can select one of more than 30 stored formats and they need only enter

Standby Power System

An alternate power system that provides three types of automatic alerts for PC power-supply failure. The SPS provides up to 200 watts of emergency AC electrical power at 117 volts for a minimum of 20 minutes during power failures.

The device has a line filter that traps and eliminates power spikes and transients in voltage during normal use. If power fails, three alarm signals are generated to alert users. A red indicator light comes on, an internal beeper sounds an alarm, and the signal from a TTY port on the back panel is changed. The TTY output can be treated in software as a constantly read port. (List Price: 200VA \$419;

New on the Market does not review products, but reports information provided by the manufacturer. If you have a product you would like to have included in this section, send a brief description that includes applications, price, and system requirements to New on the Market, PC, 1528 Irving St., San Francisco, CA 94122. Photographs and illustrations are run on a space-available basis.

New On The Market



AR-I invoicing and monthly statement program, Micro Architect

400VA \$719]
Soft America, Inc.
931 Vondolo St.
St. Paul, MN 55164
(612) 645-8531

Memory Joggers

Two quick-reference cards that show BASIC commands, function statements, DOS keys, and commands (including EDLIN), and prompts.

Both cards use color coding to depict the commands and functions. Printed on heavy cardboard, each comes with its own stand. (List Price: \$10 each; \$1.25 shipping)
J/C Computer Specialists
P.O. Box 3465
Federal Way, WA 98003
(206) 839-8268

Internal Floppy Drives

Floppy disk drives that are compatible with the PC's disk interface or the manufacturer's own floppy drive controller. One drive is single-sided, 40-track double-density and the other is dual-sided, 40-track double-density. Instructions and hardware are supplied for user installation. (List Price: Single-sided \$265; double-sided \$340)

Moynard Electronics
P.O. Box 3322
Longwood, FL 32750
(305) 869-8058

Extension Cable

A black, coil extension cable that plugs directly into the PC's keyboard. The cable has a working range of 3 to 10 feet and has shielded connectors to prevent leakage or television interference. (List Price: \$39.95; \$3 shipping)
Curtis Manufacturing Company, Inc.
One Curtis Rd.
Winchester, NH 03470
(603) 239-6807

SOFTWARE

Auto-Dialer

An auto-dialer option for the manufacturer's home management system. It allows users to dial any phone number stored in the manufacturer's Personal Computer Home Management System (PCHMS).

The Auto-Dialer handles local, long-distance, and international phone numbers and can connect with private telecom-

munications networks such as SPRINT and MCI. (List Price: \$89.95)

Requires: 64K, one disk drive, Hayes Stack Smartmodem, (printer recommended).
Arlington Software + Systems
97 Bortlett Ave.
Arlington, MA 02174
(617) 641-0290

Supermailer II

A menu-driven program designed to produce standard mailing labels from an 8-digit user code. The program can handle up to 1,000 addresses per disk. (List Price: \$29.95)

Requires: 64K, one disk drive, 80-column monitor, printer.
Heigen Corporation
Dept. AA
P.O. Box 15163
San Francisco, CA 94115
(415) 398-8050

B&L Electronic Disk

A program that allows 100K of RAM to simulate a single-sided, double-density disk drive. The "electronic drive" is referenced as Drive C and can be used to increase speed whenever a normal disk drive would be used. (List Price: Free. Users should send a diskette and a self-addressed, stamped envelope to the manufacturer, or \$6 to cover the cost of the diskette and postage. A voluntary contribution of \$15 is requested from users who find the program useful.)

Requires: 256K.
B&L Computer Consultants
226 S. Cole
Boise, ID 83709
(208) 377-8088

WordPlus-PC

A word processing program that utilizes the keyboard function keys. The program can be used by novices for their word processing needs. It includes complete word processing features and can underline and boldface text on screen. (List Price: \$395)

Requires: 64K, one disk drive.
Professional Software Inc.
51 Fremont St.
Needham, MA 02194
(617) 444-5224

FileMaster

A file management program that includes file creation and maintenance functions including conversion from or to DIF files. Report generation capabilities and full-screen displays with full cursor control are also included.

The program can allocate file space and begin storing data records. Files can be queried using up to eight selection criteria in up to seven and/or relationships.

Program functions include allocating file space, updating records, editing, copying, renaming and deletion of files, display of file statistics and file directory, and printing reports.

The program allows up to 32,767 records per file with 18 fields per record, 85 characters per alpha field, and 16 characters per numeric field. It allows for 32 data files per disk, and it can provide reports with or without titles, column headings, and page advance. (List Price: \$99.95)

Requires: 64K, two disk drives, 80-column monitor, (printer recommended).
N.F. Systems, Ltd.
P.O. Box 76363
Atlanta, GA 30358
(404) 252-5302
Source: TCK071

Project Scheduler

A menu-driven project management program that performs project forecasting, scheduling, control, and tracking of project status. The program uses "what if" analysis and can be modified to handle large, complex project plans.

The program takes into ac-

count data entry of prerequisites, fractional labor or other costs allocations, and 24 skill grades or other costs. The project schedule is presented using black-and-white or color displays to depict critical path, slack time, milestones, early starts, and completed jobs.

A comprehensive set of reports can be produced along with VisiCalc- and SuperCalc-compatible cost/resource data. (List Price: \$285)

Requires: 192K, one disk drive, (printer recommended).
SGITOR Corporation
710 Lokewey #290
Sunnyvale, CA 94086
(408) 730-0400

Print-Graf, Micro-Graf

Two graphics programs that have been enhanced to include new modes and increased functions. Print-Graf, a graphics printout program, lets users print copies of graphics screens with the PrtSc key. The user can select several sizes and orientations of the graphics on the printer page. Any number of prestored graphics pictures can be printed without having to save to disk. The normal Print-Screen function is unaffected.

Micro-Graf creates charts and graphs using data input from the operator or from another program. The user types in the data, selects the X and Y scales, the titles for the axes and the chart, and the program draws high-resolution bar charts or line graphs, or plots a linear regression curve.

The program now permits the user to save/recover the data in a file as well as the graphics picture. The data file can be generated by another program. Micro-Graf can make charts using the data and provide printouts as needed. (List Price: Print-Graf \$44.50; Print-Graf and MicroGraf \$79.50;

Print-Graf, Micro-Graf, and Graftrax \$149.50)

Requires: 48K, two disk drives, color/graphics adapter, Epson Graftrax, Epson or IBM printer. Micro-Z Electronic Systems
P.O. Box 2426
Rolling Hills, CA 90274
(213) 377-1640

MetaGraph

A business graphics program that allows users to create charts and drawings and save them on disk. Users can create maps and custom charts along with line plots, bar graphs and pie charts.

The screen can be used as a sketch pad to prepare free-form graphics consisting of lines,

PGL Business Graphics System

A graphics program that allows for definition of bar graphs, line graphs, pie charts, and word charts by using fill-in forms. The program was built on top of the Peachtree Graphics Language (PGL) and uses the forms to provide multichart pictures. The pictures can contain combinations of line graphs, bar charts, pie charts, area graphs, and word charts.

Users can select a chart format from a book and prepare the form before using the PC. To define a chart, users must edit three separate forms: the Axis,

Chart-Master

An expanded version of the manufacturer's menu-driven business graphics program that uses financial, marketing, and other business data to create charts and graphs using Hewlett-Packard plotters.

New features include on-screen previewing of charts, multiple character fonts, and several chart types. Users can create different types of charts, such as area plots, mixed bar and line charts, and high/low/close charts.

The program was designed for novice and experienced users. The size, location, and ori-



Extension Cable. Curtis Manufacturing Company

areas, and text. A set of pens of different shapes, colors, and patterns is provided. On-screen pictures can be edited by altering color, patterns, and line types. (List Price: \$495)

Requires: 128K, two disk drives, CP/M-86 or MS-DOS. Graphicon Systems
333 Cobalt Way #106
Sunnyvale, CA 94086
(408) 980-7180

Data, and Text forms. (List Price: Graphics package \$475; language \$600)

Requires: 64K, one disk drive. Peachtree Graphics Language, (plotter and printer recommended).
Peachtree Software Inc.
3445 Peachtree Rd. N.E.
8th Floor
Atlanta, GA 30328
(404) 262-2376

entation of a chart can be controlled by the user. Users can also plot up to nine charts per page, select typefaces for titles and labels, specify the scaling of a left and/or right Y-axis, or place "floating" legends anywhere on the chart.

Program options include grid lines, log axes, footnote and frame capabilities, a variety of hatching patterns for bar and

New On The Market

pie segments, a choice of line-types and moving averages and curve-fitting. (List Price: \$375)

Requires: 128K, two disk drives, asynchronous adapter, Hewlett-Packard plotter 7470A or 7220. Decision Resources, Inc. P.O. Box 309 Westport, CT 06881 (203) 222-1974

132-column printer. Micro Architect Inc. 96 Dothton St. Arlington, MA 02174 (617) 643-4713

Plan 1040

An income tax program that allows users to perform "what if" analysis of tax strategies. The

Key/Spread

A financial-statement spreading system that was designed for novices who have no prior experience in bank credit departments.

Users can input financial statements to the PC without filling out an input sheet or performing calculations. Menus

The package can be run by users who have no experience in accounting. It contains 11 menu-driven basic programs and sample files. A Master Index links all the programs and provides on-line information for Inventory Control, Accounts Receivable, Accounts Payable, and Payroll. (List Price: \$795)

Requires: 128K, two disk drives, printer. Performance Engineered Programming 3970 Syme Dr. Corbush, CA 92006 (714) 434-8023

Perfin

A personal financial program that provides checkbook features. The program was designed for nonaccountants. Program features include query, multiple user-assigned accounts, expense analysis, and budgeting features. Editing utilities and different screen and printer reports are also available. (List Price: \$65 including manual)

Requires: 64K, one disk drive, 80-column monitor, (printer optional).

Digitol Engineering Group, Inc. 11599 Katy Fwy. #150 Houston, TX 77079 (713) 531-6100

Money Decisions Volume II

A collection of 36 business and financial problem-solving routines for business professionals. Many of the programs use integrated graphics support to enable users to perform advanced business calculations and financial analyses.

The package can be used independently or with Volume I. Users can automatically display and print results on a graph when using programs together.

Features include a master menu display for each category



Visionary 100 data communications device, Visionary Electronics

Integrated Accounting Package

A hard disk version of the manufacturer's accounting package. The program includes General Ledger, Accounts Receivable, Accounts Payable, and Payroll. Each of the program functions can stand alone or be integrated with the General Ledger.

The number of transactions per period is nearly unlimited due to the amount of disk storage on the hard disk.

The hard disk features automatic backup with the date stamped at the end of a period. (List Price: Complete program \$717 including manual; individual functions \$199 each; manual only, \$25)

Requires: 84K, one disk drive,

program was designed for accountants, attorneys, and executives, but it can also be used by novices.

The program can run almost any number of tax strategies. Plan 1040 covers tax years 1982 and 1983 and includes the 1982 Tax Equity and Fiscal Responsibility Act. Answers show taxable income and all the various alternate tax results. A summary is printed for each "what if" hypothesis. (List Price: \$150 including manual)

Requires: 84K, one disk drive, (printer recommended). SAB, Inc. 10 Nevada Dr. P.O. Box 1010 New Hyde Park, NY 11042 (516) 775-5566

and yes/no questions aid users in the spreading process. Other features include renaming accounts and handling interim statements. (List Price: \$5,000 including software, consultation, and configuration where necessary)

Requires: 128K, two disk drives, monochrome display, printer. Analytic Systems Inc. 24 Old Kings Hwy. South Darien, CT 06820 (203) 655-7426

Pep Business System

A business software package that includes Inventory Control, Accounts Receivable, Accounts Payable, and Payroll functions with an interactive General Ledger.

INTRODUCING

STAR SYSTEM 1

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Accounts Receivable with
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Accounts Payable with
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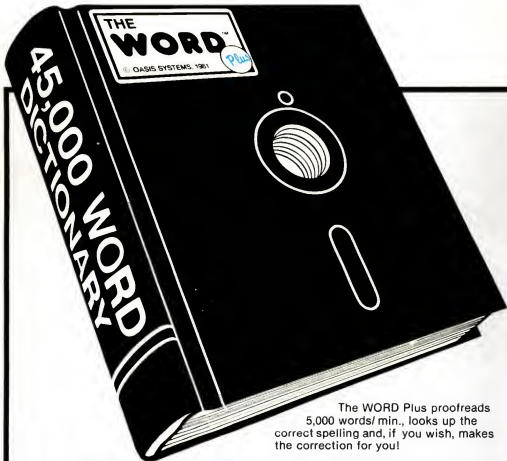


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Mince is a trademark of Mark of the Unicorn.

A photograph of a single red rose on a stem with several green leaves. The entire rose, stem, and leaves are outlined with a dashed line, indicating they are designed to be cut out. The rose is positioned at the top right of the frame, and the stem extends diagonally down towards the bottom left.

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New On The Market

selection, a tutorial feature to place the manual on screen, one screen format for all functions, and single-key commands. Manuals for both packages use illustrations, color, and graphics. (List Price: \$229; Volume I \$189) **Requires:** 64K, one disk drive, (printer recommended) Eagle Software Publishing, Inc. 993 Old Eagle School Rd. #409 Wayne, PA 19087 (215) 964-8660

TCW/DMS

A group of menu-driven information-management programs designed for novices. The package contains more than 20 programs, over 6,000 program statements, and it can run at three levels of complexity.

At Level I users can create files and ensure system and file protection by using an optional password system. Records can be added, changed, deleted, restored, displayed, and compressed. User-defined screen layouts allow for up to 50 titles and up to 24 fields.

Level II employs a query language and allows for user-formatted reports, file conversion, plotting, and statistics.

Level III provides for file merge, restructure, linkage, and preprocessing. (List Price: Entire package \$359; Level I \$189; Level II \$89; Level III \$89) **Requires:** 64K, two disk drives (printer recommended). The Computer Workshop 322 Sheldon Ave. Houghton, MI 49931 (906) 482-8009

Video Display Terminal Emulator (VDTE)

A menu-driven terminal emulator and file transfer system that communicates with any remote or in-house computer. The program emulates HP26xx and VT52 terminals. In HP26xx

mode, high-resolution HP26xx vector graphics plotting sequences are supported. The VDTE provides a full 80x25 character display in alpha mode and a 640x200 grid in graphics mode.

The program can set several speeds including 300, 1,200, and 9600 baud. The program can upload and download files, op-

accepts the PAL design specification as an input file, verifies the design against a function table, and generates any of several optional output files.

The program can assemble PAL design specifications, translate the logic equations to PAL fuse patterns, and execute a simulation that exercises function table vectors. The program

After the user has typed the screen format onto the terminal, the design subsystem will automatically generate a BASIC coded Screenform Recall Routine. This routine consists of the BASIC statements necessary to display the screen form and tells the Dynamic Input Routine where the data fields are on the display terminal.

The Dynamic Input Routine will accept any, all, or a partial range of the data fields, either sequentially or by the user's random placement of the cursor. Corresponding to each data field is an attribute character that controls the characteristics of the data field.

The routine allows users the full use of cursor, tab, back tab, delete character, insert, and erase from cursor keys, but it will not permit nonfield data input. This feature ensures that the screen form will not be inadvertently destroyed during data input. (List Price: \$395)

Requires: 32K, two disk drives, monochrome adapter. River Jordan Mission 223 Shool Creek Dr. Lake Jordan, AL 36022 (205) 569-2352

PC/Format

An interactive screen formatter designed to simplify keyboard data entry and screen format displays. The program handles the combination of legal and illegal character codes entered from the keyboard.

PC/Format performs all of the required data entry character editing and field justification defined for the data record before it is passed to the calling program. Screen formats consisting of prompt and entry fields are created, maintained, and administered apart from the user's program. Any screen format can be changed without restructuring or relinking the ap-



Portable keyboard, Computer Practice Keyboard

tionally log terminal sessions, and send predefined sequences. On- and off-line processing can be intermixed. (List Price: \$50 including manual) Inner Loop Software P.O. Box 45857 Los Angeles, CA 90045 (213) 645-5162

PAL CAD

A computer-aided design package for designing Programmable Array Logic (PAL) devices. The PAL family of 15 semicustom integrated circuits was invented and patented by Monolithic Memories, Inc. The program is based on the PALASM software package to run on mainframes. PAL CAD can be used to define, simulate, build, and test PALs. It

also prints a picture of the pin-out configuration, prints fuse plots, and generates hexadecimal or binary programming format files. (List Price: \$495) **Requires:** 128K, two disk drives. Force Technology Corporation P.O. Box 20955 Son Jose, CA 95160 (408) 268-3359

Dynamic Screen Forms

A screen-design/data-handling package that operates as a design subsystem and a Dynamic Input Routine. The design subsystem allows users to design, create, and maintain screen forms, maps, and menus for custom applications.

Users can create headings, prompts, and data input fields.

New On The Market

applications program as long as data fields do not change in length or record position. (List Price: \$99)

Requires: 64K, one disk drive. Micro Express 3857 Birch St. #109 Newport Beach, CA 92660 (714) 859-7575

PC-FORTH

A fig-FORTH version of FORTH for use as a software development system. The program includes special dump and printer functions in addition to standard fig-FORTH words and fig-EDITOR. The editor and compiler features are resident in memory. (List Price: \$59.95)

Requires: 16K, one disk drive. Armadillo International Software P.O. Box 7661 Austin, TX 78712 (512) 459-7325

WSP FORTH

A program that can be used by computer novices to create applications software. Based on fig-FORTH, the program has a high level of programming power and comes with its own editor and utilities. (List Price: \$75)

Requires: 64K, one disk drive. World Wide Software Publishers 2555 Buena Vista Way Berkeley, CA 94708 (415) 644-2850

New Reset

A program that provides two additional types of resets for DOS. The resets use keys Ctrl 1, Ctrl 2, and Ctrl 3 for single-handed control operation. Ctrl 1 functions like the existing Ctrl Alt Del sequence. Ctrl 2 functions similarly except that memory is not erased. Memory is erased using the standard reset. This reset can be used in conjunction with electronic disks and other programs in which information

may be in memory when reset is invoked.

The third reset does not involve rebooting from the disk and returns the users to the DOS prompts. Since memory is not altered and no code is loaded from the disk, a DOS disk is not required for Driva A. (List Price: Free. Users may send either a disk and a self-addressed, stamped envelope or \$6 to cover the cost of the disk and postage. A voluntary contribution of \$10 is requested from users who find the program useful.)

Requires: 64K, one disk drive. B&I Computer Consultants 226 S. Cole Boise, ID 83709 (208) 377-8088

EtherSeries

A series of products that will connect PCs in an Ethernet local network environment. The EtherSeries consists of EtherLink and EtherShare, which are plug- and software-compatible with the PC. They provide users with the local network features of peripheral sharing, information sharing, and personal communications.

EtherLink includes a plug-in controller/transceiver board, software disk, and user manual. The software lets users share files with one another and share printers at other PC stations. Each station retains all PC capabilities as well as network participation.

EtherShare is a file server with a 10-megabyte-capacity disk drive. It supports many network stations concurrently and allows users to make use of fast disk access, high-speed data transfer, and large storage capacity. Common data files, text files, and programs on EtherShare can be accessed by all users on the network. (List Price: EtherLink \$950; EtherShare \$11,500)

Requires: 64K, one disk drive. 3Com Corporation 1390 Shorebird Way Mountain View, CA 94043 (415) 961-9602

QUICKCODE Version 2.1

A new version of the program generator used with the DBMS dBASE-II (Ashton-Tate). It allows both novices and experienced programmers to generate a variety of programs. The generator can be used either independently or with dBASE-II to complete a project.

New features include creation of 132-column screens and forms and the ability to print mailing labels four-across automatically. The generator also includes dSCAN, which lets users print, edit, or delete selected parts of a data base based on user-defined selections. (List Price: \$295; upgrades for licensed users \$25)

Requires: Xerox Baby Blue. Fox & Keller, Inc. P.O. Box 1053 Teaneck, NJ 07666 (201) 837-0142

Ramsak

An arcade-type game in which players accumulate points by "eating" diamonds and gold coins depicted on the screen. As players build up points, the game grows in complexity. (List Price: \$29.95)

Requires: 64K, one disk drive, 80-column monitor. Iteigen Corporation Dept. AA P.O. Box 15163 San Francisco, CA 94115 (415) 398-8050

Millionaire

A simulation game that lets users manipulate as many as 15 different stocks such as IBM, Exxon, and Bendix. The game can be used by experienced and

novice stock market players. Transaction formats include buying and selling stocks, call and put options, buying on margin, and borrowing against net worth. Players can summon each of the 15 stocks' corporate histories as well as week-by-week industry trends and graphs. (List Price: \$99.95) **Requires:** 64K, one disk drive. Blue Chip Software 19624 Ventura Blvd. #125 Woodland Hills, CA 91364 (213) 881-8288

AR-1

A menu-driven, invoicing and monthly statement generating system that keeps track of current and aged accounts receivable. The package is interactive, self-instructing, and integrated with the manufacturer's General Ledger system. ISAM is used for fast key access. The program supports the open item, balance forward, and auto-billing account types. (List Price: \$248 including manual)

Requires: 64K, two disk drives, 132-column printer. Micro Architect Inc. 96 Arlton St. Arlington, MA 02174 (617) 643-4713

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Computer Practice Keyboard Co. 616 9th St. Union City, NJ 07087 (201) 863-0999

A Foundation For Computer Literacy

This book provides a glimpse into the lives of some eminent computer pioneers.

The Computer from Pascal to von Neumann
Herman H. Goldstine
(Princeton University Press, Princeton, 1982)
378 pages; \$6.95

This review departs from the usual fare of books reviewed in this column. We are making a pilgrimage to the sanctified land of computer literacy. We do this because people of the computer age ought to know how computers came to be, and because we are tired of reading books about how to program in BASIC or how to make big bucks writing applications systems in your spare time.

The term "computer literacy" means different things to different people. We hear about the necessity of becoming computer literate with the implication that those who don't will be doomed to permanent career inferiority and intellectual sterility. This is heard mostly from people who are in the business of selling products designed to confer this modern equivalent of divine grace. The hullabaloo about computer literacy is 80 percent marketing and 20 percent the kind of one-upmanship that turns natural interest into fear of being left behind when anything new comes along.

Prehistory of the Computer

The first part of the book covers the period before the development of the modern electronic computer in 1946. This section would have been more interesting had Goldstine written more about the dreamers and eccentric geniuses who were so far ahead of their time.

Charles Babbage and Herman Hollerith are two men who are prominent in Goldstine's appraisal of this era. Babbage was something of a curmudgeon whose ideas were seminal in the development of computers. In the late nineteenth century he designed several machines to imple-

ment his ideas. The tragedy was that while building one machine, Babbage would become obsessed with an idea for another. He would immediately abandon his present project and begin developing a new machine. His legacy of brilliant thoughts and incomplete machines profoundly influenced later generations of researchers.

While working for the 1880 United States census, Hollerith invented the punch card as a means of storing and sorting information. His invention vastly increased the speed of data analysis. He also founded a company that eventually became IBM.

The First Micro

The second part of Goldstine's book deals with the personalities and developments that led to the creation of the first electronic computer. The crisis of World War II greatly accelerated efforts to find more efficient ways to do laborious calculations, such as determining reliable tables that would predict where a bomb or artillery shell would land.

THE
*hullabaloo about
computer literacy is 80
percent marketing.*

Goldstine was a World War II Army captain assigned to the Ballistic Research Laboratory at Aberdeen Proving Ground in Maryland, where he supervised the manual calculation of bombing tables. Goldstine writes at length about the mathematical principles involved, but gives little attention to the human side of history.

The efforts of Goldstine and his colleagues resulted in a research project funded by the University of Pennsylvania

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nia's Moore School of Electrical Engineering. It was at Moore School that ENIAC was designed and built and where the design principles were formulated that led to digital computers.

Goldstine covers this period with his usual plodding prose. He writes about these historical developments from the point of view of one who was on the scene. What he finds worth describing, however, is often no more than petty politics among university officials. In a few passages Goldstine does give a sense of the ingenuity and dedication of the men who worked at the Moore School.

Some of the best material in the book examines such momentous decisions as adopting random access memory instead of serial memory design. But these passages come and go so casually that their significance is often obscured.

Goldstine worked closely with John von Neumann, and it is apparent that the author has the greatest admiration for him. Von Neumann made major contributions

not only to the field of computers but also to the early atomic and hydrogen bomb projects. In fact, one of the reasons for von Neumann's interest in developing computers was to solve the problem of detonating an atomic bomb.

According to Goldstine, von Neumann was instrumental in developing and documenting the ENIAC project. In 1945 he authored a report based on his experience with ENIAC; it was intended to be a summary of the principles on which ENIAC's successor, EDVAC, would be built. The report, "First Draft of a Report on the EDVAC," incorporated many of the best ideas formulated by the ENIAC project staff.

The "First Draft" is the Bible of computer science, defining for the first time the five elements that constitute all computers: a unit to perform arithmetic operations; a unit to control the running of a program; a memory in which to store both the program and numbers used in calculations; an input; and an output. Von Neumann referred to these elements as

organs, partly because he saw the computer mirroring many functions of the human nervous system. Some of his theories on computer design were based on this parallel structure between man and machine.

Goldstine emphasizes von Neumann's considerable contributions (while neglecting other important figures) and writes about him with a vitality that is often lacking elsewhere in the book. The few personal anecdotes in the book detail von Neumann's prodigious feats of memory and mental calculation. Little of the writing illuminates von Neumann the human being or the personalities of other historically important figures. Goldstine confines himself to meticulous descriptions of their work and ideas, copiously documented with footnotes that include many references to his personal correspondence. These footnotes, however, may be the best part of Goldstine's work; they serve as an excellent bibliography for students of computer history. The book also includes a few fascinating photographs of early computing machines that date back to Pascal, and a brief appendix on computer developments in other countries during the 1950s.

Postwar Developments

The final section of the book covers the postwar period. The Moore School discontinued its pioneering research and those men who collaborated on ENIAC and EDVAC went their separate ways. Goldstine and von Neumann were instrumental in transferring the computer science center to the Institute for Advanced Science at Princeton.

Much of this section chronicles the disputes about who invented what, who owned what patents, and which government agencies were working with which university or corporation. The "First Draft" was released publicly in the interest of sharing what was then considered pure research. Few minds could envision the vast industry that would grow out of this obscure beginning.

The Computer from Pascal to von Neumann may not be a great historical document, but it provides information that helps demystify the presence of the computer. The important lesson of computer literacy is that computers illuminate who we are; a machine is only a reflection of its makers and a testimony to their efforts. / PC

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Aerocomp	270	ComputerLand	230	IB Magazine	214
Affordable Software	198, 345	Computer Mail Order	328	IBM	56-57
Alpha Byte	79, 95	Computer Mate, Inc.	374-375	ICR FutureSoft	28
Alpha Software Corp.	12-13, 42	Computer Systems Designs, Inc.	336	Ide Corporation	282
Alphanetics	65	Computerwise	158	Indigo	193
Alta Systems, Inc.	335	Computer Workshop	342	Individual Software	281
Amdek Corporation	88	Computerworld International, Inc.	257	Infocom	112-113
American Computer Products	242	Continental Software	182	InfoPro	62
American Small Business Computers	322	Contract Services Associates	139	Information Unlimited Software, Inc.	24
American Training International	9	Control Systems	314	Innerloop Software	334
Angel's Computer Products	330	Coosol, Inc.	258, 344	Innoys	27
Ann Arbor Software	201	Corona Data System	7	Intellect Associates, Inc.	346
Apparat, Inc.	86	Corvus Systems	186	Intelligent Statements, Inc.	130
Applied Creative Technology, Inc.	243	CTI (Computer Technology Innovations)	94	Intermedia Systems	394
Applied Software Technology	303	Cuesta Systems, Inc.	189	International Software Alliance	244
Apstek, Inc.	245	Curtis Manufacturing Company, Inc.	17C	International Software Engineering	233
Archives, Inc.	51	Cybernetics, Inc.	210	Intersoft (Measurement Science)	346
Arlington Software Systems	323	Data Consulting Group	328, 334	Ipx International, Inc.	339
Armonk Corporation	295	Data Link	126	Ivy Research	329
Arrix Logic Systems, Inc.	290	Datamost	108, 189	Jack Strick & Associates	319
Artificial Intelligence Research Group	339	DataSource Systems	70	James Michael Hall	340
Ashton-Tate	144-145	Davong Systems, Inc.	208	Johnson Associates Software	61
Aspen Software Company	118, 325	Decision Resources	151	Keytronic, Inc.	114
AST Research Inc.	312-313	Denberg Industries	103	Laboratory Microsystems	87
Atara, Inc.	293	Diamond Software Supply Co.	47	Leading Edge Products, Inc.	120-121, 18C
Automated Business Machines Inc.	232	Digital Engineering Group	328	Lifetab Associates	302
BASF	14	Digital Marketing	22	Lifetree Software Inc.	328
B.C. Systems Inc.	155	Diskette Depot, Inc.	319	Lighthouse Distributing	307
Beaman Porter	378	Disks, Etc.	345	Link Systems	391
Bella Computers	135	Displex	83	Logical Devices	341
Berzark Systems	340	DP Computer Services Co.	125	Max Software Publishing	192
Best Programs	193	Eight Hundred Software	360	Maynard Electronics	284
Bible Research	282	Electronic Data Systems Corp.	311	MC/N, Inc.	55
Binary Research	327	Electronic Specialists, Inc.	339	Med Systems Software	128
Blaise Computing Inc.	323	Emerging Technology Consultants, Inc.	134	Metasoft Corporation	109
Blue Chip Software	252	EPYX/Automated Simulations, Inc.	178	Microcom	68, 396
Blue Water Systems	212	Escon Products, Inc.	316	Microcomputer Business International	199
Bottom Line, The	250	Executive/Aeronca	319	Micro Flash	344
BSG/ARI American Research	157	Fantasia Systems Incorporated	329	Micro-G	334
B.T. Enterprises	294	Fast-Lane Management	342	Micro Grip	338
Business Master	337	First Cabin Software	307	Micro House	178-177
Cab-Tek, Inc.	330	First National Computers	327	Micro Instructional, Inc.	388
Cactus Technology	215	Flagstaff Engineering	343	Micro Investment Software (MIS)	91
Calabrese Publication	330	Fox & Geller	90	Micro Marl	154
California Micro Computer	336	Frank Schiele Software	344	Micro Match	346
CBS College Publishing	161	Frederick Computer	43	MicroRad Associates	109
Centec	249	FTG Data Systems	101	Microsoft, Inc.	110, 194-195
Charles Mann/CMA	330	Funtastic, Inc.	191	Microsynergy	86
Checks To Go	191	Putra Company	349	Micro Systems Exchange	331
Colby Computer	94	Gamania	346	Microteure	295
ColorCorp	11	Genie Computer Corp.	41	MicroWare	139
Columbia Data Products, Inc.	143	Graphic Software	207	Miller Microcomputer Services	100
Comprehensive Software	122	Hayes Micro Computer Products	120	Morgan Computing Company	280
Compad	309	H&E Computronics	19	MPPI	316
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Northeast Exposition	288	Software 'n' Stuff	332
Novell Data Systems	240	Software 1848	251
Oasis Systems	386	Software Options	142
Omicron Engineering Systems	375	Software Technology for Computers	35
Omicron	293	Sorcin Corporation	2, 3
Orange Micro—Red Barron	392	Southeastern Software	261
Organizational Management Systems	338, 335	Spectrum Software	287
Owl Software Corporation	88	Spinnaker Software	80-81
Pacific Data	33	Squire, Buresh Associates, Inc.	346
PBL Corporation	293	SSR Corporation	278
P.C. Cat	98	Star Computer Systems	385
PC Connection	93, 331	Star Logic System	354
PC Software	22, 117, 222	Star Micronics, Inc.	23
[PC]	38	Starside Engineering	342
PCEZ Company	148	STB Systems, Inc.	175
PDS, Inc. (Compushack)	204-285	Stone Software Publishing	337
Percom Data Company Inc.	224	Street Electronics	158
Perfect Software	34	Strictly Software	223
Performance Engineering Programming	346	SuperSoft	18
Periplex Inc.	273	Survey Systems, Inc.	102
Personal Computer Products	331	Synergistic Software	208, 308
Persyst, Inc.	288	Systemics	110
Peter Norton	354	Systems Management Associates	345
Plantronics/Frederick	97	TAC	387
Practical Peripherals	48-48	Tall Tree Systems	264
Princeton Graphics System	393	Tallgrass Technologies Corporation	301
Prism Products, Inc.	85	Target Technology (Accusoft)	332
ProComp International	21	Target Technology (Creative Graphics)	77
Produta, Inc.	283	TCI Software	278
Professional Micro Systems	58	Tech-S, Inc.	44
Professional Software	152-153	Tecmar Inc.	OBC
ProSoft	264	Telecom Systems	340
Proximity	138	T.G. Programs	256
Pure Data Ltd.	288	Ticom Systems, Inc.	221
Puyallup Valley Software	342	TK Engineering	132
Pyxel	332	TMQ	333
Quadrant Corporation	8-9, 87	Tokyo Electronics	188
Quake	146	Transaction Store	278
Quibie Distributing	225	2 Y's Association Ltd.	245
QuCoS, Inc.	178, 255	UOI Company	328
Quest Research, Inc.	341, 343	U S Software	172
Redgate Publishing	88	USI International	184
Riverlake System	338	Vector Electronic Company	341
Rocky Mountain Software Systems	337	Versa Computing	258
RTCS Corporation	338	Virtual Combination	317
Satellite Software	48	VistiCorp.	58
Saturn Consulting	343	Vista Computer Company, Inc.	68
Scitor Corporation	127	Von Leivendyke Enterprises	39
Seattle Computer	180	VR Data Company, Inc.	305
Sierra On Line, Inc.	298	Westco Inc.	218
Sigma Designs	263	Williams & Foltz	388
Simple Soft	137	Wood & Clay	377
Single Source Solution	268	Word Associates	346
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Social & Scientific Systems	343	Yucaipa Software	328
Sofstar	147	Zeke, Stokes & Harbour (U.M.S.)	282
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Soft Spot Micro Systems	231	Zobex	171
Softech Micro Systems	238		

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URING THOSE
AND FRANKLIN



"So I saved
GUY, HEY, I'M
GOING TO GO TO
THAT AGAIN, BUT
SHE WON'T STAY
FOR US GETTING
INVOLVED IN THE
BURNETT AND M
REALM 'UNLESS'
EXACTLY WHY THE

Next month PC focuses on communications, ranging from modems to combo boards to over-the-phone services that enable you to shop in the comfort of your own home.

A comparative review of two popular communications networks.

PC looks at selected software packages to meet communications needs. Included are reports on HostComm by N.F. Systems, Nestar's local area network, and a communications program that you probably didn't even know existed on your DOS disk.

Cheaper than a telephone call and more versatile than a message service, telecommunications allow computer users to parley over the wires. PC also includes a review of the applications and the future of high-speed data transmission, an update on information retrieval, and a report from Wall Street on the secrets of the Technical Market Index.

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Wish List

FOR TEACHERS -
A peripheral that
recognized the spoken
word and that was keyed
to individual voice timbre
(a security feature). The

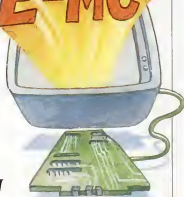


input device would recognize such data as student names,
test scores, and letter grades, including pluses
and minuses. Kathy J. Russell Davis CA.

It's time for someone to make
a graphics card permitting us
to put algebraic equations
with super/sub scripts
on the screen.

Louis LaPointe
Minneapolis Mn.

$E=MC^2$



I would like to see
the IBM PC keyboard
have small raised
bumps on the eight
home row typing keys
on the "5" on the numeric keypad.

Terry D. Lowe
San Diego CA.

PC invites readers to contribute Wish List ideas for publication. Any product, service or design idea you'd like to see for the IBM Personal Computer is appropriate. Ideas selected for publication may be illustrated by PC's artist. PC will pay \$25 for the featured Wish List idea in each issue, \$10 for others published. All ideas published will be credited to the submitter and become the property of PC. In case of duplicate submissions, any award will go to the earliest postmark. Send a description or sketch of your idea to: Wish List, PC, 1528 Irving St., San Francisco, CA 94122. Sorry, we can't discuss the Wish List feature by telephone.

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a dinosaur out of you.

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SPEED

MX-80: 80 cps, for 46 full lines
per minute throughput.

PROWRITER: 120 cps, for
63 full lines per minute
throughput.

GRAPHICS

MX-80: Block graphics standard,
fine for things like bar graphs.

PROWRITER: High-resolu-
tion graphics features, fine
for bar graphs, smooth curves,
thin lines, intricate details, etc.

PRINTING

MX-80: Dot matrix business
quality.

PROWRITER: Dot matrix
correspondence quality, with
incremental printing capability
standard.

FEED

MX-80: Tractor feed standard;
optional friction-feed kit for
about \$75 extra.

PROWRITER: Both tractor
and friction feed standard.

INTERFACE

MX-80: Parallel interface
standard; optional serial
interface for about \$75 extra.

PROWRITER: Available stan-
dard—either parallel interface
or parallel/serial interface.

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